The Collectors' Mining Review

ISSUE NUMBER 1 FALL 1996

IN THIS ISSUE:

THE GIANT POWDER COMPANY CONSOLIDATED

The various brands of **"Gelatines"** manufactured under the **"Giant"** brand are particularly adapted to general mining work and tunnel driving. All are Plastic Compounds readily loaded into drill holes regardless of their direction; possess high breaking qualities, and when completely detonated, are practically free from noxious gases or fumes.

"Giant Gelatine" is our reliable standard and has been on the market too long to require comment.

"V. L. F. Gelatine" (Very Low Freezing) met with unparalleled success in such sections as have low winter temperatures and may be considered the latest development in Low Freezing explosive compounds.

Both foregoing grades are very little affected by contact with water.

"Ammonia Gelatine"—a good product and popular where close workings are encountered.

"V. L. F. Ammonia Gelatine" possesses the Low Freezing feature.

Ammonia Gelatine grades of Giant brands may be considered practically equal to our **Standard and V. L. F. Gelatines,** except that their moisture resisting qualities are not so highly developed as in the two last mentioned grades. The slightly lower cost of the **Ammonia Gelatine is,** however, worthy of consideration.

To insure best results with our Gelatine Compounds we recommend the No. 6 Blasting Caps, or the No. 6 Electrical Caps, manufactured by the California Cap Co.

THE COLLECTOR'S MINING REVIEW

A Beer Reviewed Journal

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Cover Photo:
Herbert Walker
Monite Explosives Company
circa 1930
Ruth Pit, Ely, Nevada

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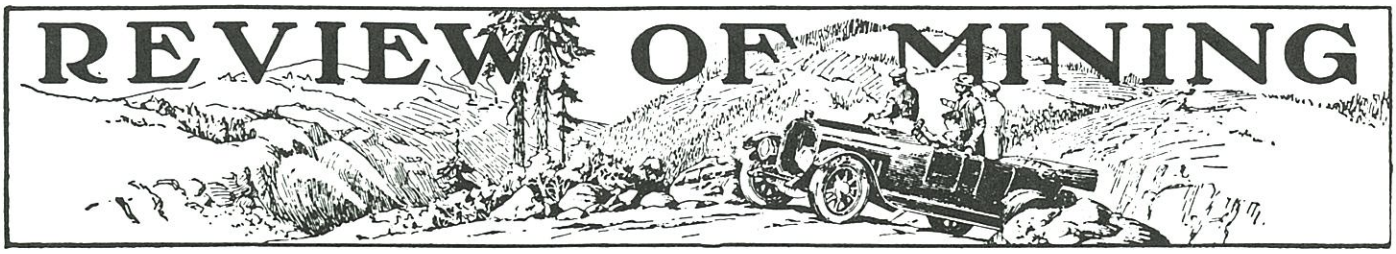


EDITORIAL

"The Collector's Mining Review" is a new periodical dedicated to mining history and its lasting vestiges. Once the driving force of the nation's economy and settlement of the West, mining has now assumed the role as whipping boy for environmentalists, represented only as an amusement ride or grotesque architectural caricature. Through these pages we wish to inform our readers by celebrating the lifestyle, equipment, and history of a way of life now - all but forgotten.

We will focus on all types of mining artifacts and provide historical background with a bias toward the western half of the United States. It is hoped that this will be a publication that can be read on one level as an enjoyable descriptive journal and on another level, as a serious researched historical document. We dedicate this to all the mining preservationists and field historians who have saved the mining memorabilia from destruction and decay, and perpetuate the tradition of mining.

The articles found within will be the product of the editors and the readership, encouragement is hereby given for contributions of all kinds. The collection of mining artifacts is undergoing a slow but significant change and we will attempt to report the details to you. After many years of relatively easy collecting at yard sales, antique shops, and abandoned mines, these resources are becoming exhausted or overpriced. For the avocation to be vibrant and active - the exchange of artifacts and information has to be frequently disseminated among the loose knit organization of collectors. Lamp-in's, informal backyard swaps and electronic market places such as 'Mining Collect' will allow all collectors to have the opportunity to trade, buy, or sell and attract new participants as well as keep the rest of us entertained. This periodical will be dedicated to that transmission of information.

WHY THE COLLECTOR'S REVIEW?

We're not in competition with other publications such as the "Eureka" but seek to complement them with additional coverage of those aspects of mining not related to lighting and concentrate more on the western U.S. The "Review" will seek to fill a niche left by a previous artifact-related periodical no longer in publication.

We are sending this issue as a complimentary one so that the readers can judge its contents and decide if they wish to subscribe for the next 3 issues. A subscription form is enclosed for convenience. Please examine this publication and let your friends know that we're signing up subscribers now.

ANDY'S PHILOSOPHY

Here's some advice from Andy Martin on the preservation of wooden artifacts:

1. Don't do anything you can not undo. No shellac, varnish, etc. Don't let sun melt the wax. Be careful that the grease on a slimy board does not rub on to others. Don't let long term exposure to sun bleach litho candle ends.

2. Cleaning - I use a garden hose, be careful not to blast off lettering. Dry items in the shade.

3. Record where it came from - mine - date - who found it, perhaps level it came from. I just write in the back side of the item (breaking rule #1). You can also staple a piece of paper to the backside.

4. Repairing. White glue (will dissolve in water), rubber bands, vice grips and staples (for temporary stabilization) are used.

5. Nails - probably best to leave as is, but I often pull them, or hammer till flush. Try to leave at least one, so people know if it is a cut nail, or wire nail piece.

6. Storage. Be careful about rubbing damage. For best pieces I sometimes wrap in cloth, and then garbage bag. In garage or shed, keep them off the floor to avoid water damage, watch for bugs and termites.

7. You don't have to haul every scrap out of a mine. Photo cruddy items and put 'em back if you don't want 'em. If you get something home and then find no one wants it, return it to the mine if not too much trouble.

- Andy 

MONITE EXPLOSIVES, INC. 1925-1933

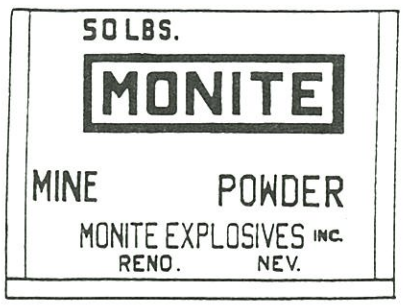
by Eric Twitty
Boulder, Colorado

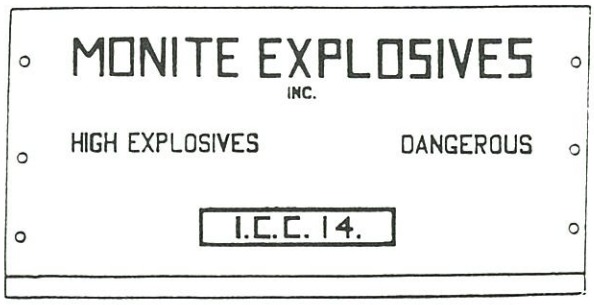
Monite Explosives, Inc., organized in 1925, was one of only a few makers to manufacture a successful TNT commercial high explosive. It operated a small plant in Lacey, Washington near Tacoma from which it served mining, logging, and land development in the Pacific Northwest. One of the main selling points of Monite was that it was impervious to cold and it did not produce the dreaded "nitro headache" associated with nitroglycerine dynamite. Thus it was mildly popular in cold climates and on projects involving a lot of surface basting where dynamite was exposed to freezing cold.

In 1927 Monite Explosives opened a sales office in Reno, Nevada in hopes of capturing some of the Nevada/California market. Business with western Nevada mining companies, utilities, and surface projects was so good that Monite Explosives constructed a branch plant in a small, isolated valley several miles east of Reno in 1930. The plant was well financed, well engineered, and totally modern. Most of it was built of brick, concrete, and steel and nearly every step in the manufacturing process had its own, dedicated building.

The first step in making Monite was drying refined ingredients in a kiln and storing them in hoppers. The ingredients were ground and sent to a 500 pound-capacity mixing drum that took as little as 20 minutes to mix a batch. The explosive traveled to an automatic packing machine that tamped the bulk Monite into paper cartridges. The

Early 1930s ad run in newspapers from Reno to Sacramento calling for Monite dealers in hopes of generating sales to keep its new factory hopping.





AGE: 1930-1933; RARITY: one known: Lane Griffin (side) and Martin Jensen (end). This box is a curious exception to Interstate Commerce Commission (I.C.C.) mandate if 1914 requiring box walls be joined with lock corner construction. Also, compare this with Dennite's box - construction is identical.

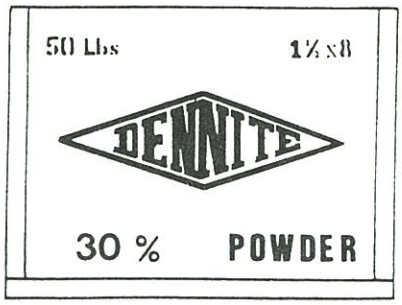
resulting cartridges were taken on a baby gauge rail car to the boxing house and hence to the storage magazine.

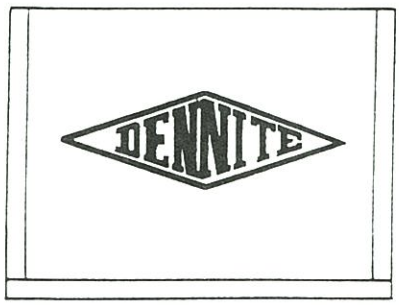
For reasons unknown Monite Explosives was dissolved in 1933. The Lacey plant was subsequently operated by the J.A. Denn Powder Co. and the Reno plant was reorganized as the Rocky Mountain Powder Co., which also was dissolved shortly thereafter.

Postscript

Recent events have put the Monite Explosives Company back in the spotlight. In 1993 a drum containing explosive components was found in an open field near Sparks, NV. The subsequent investigation revealed that this was a remnant from the old Monite Manufacturing site. Unfortunately no old boxes were discovered. Since it was on B.L.M. land an examination process was begun to begin the restoration and remediation process. In typical governmental style, a full scale study was begun with the usual media hype and high priced consultants hovering. They couldn't just decontaminate and bury it - no, they have to educate us and justify their job positions.

In a great show of force, they took the drum of explosives to an open field, and instead of burning or decomposing it, they used a great quantity of new explosives (using the P=Plenty formula) to set off an explosion equal to the amount of new explosives.





AGE: 1932-1936; logos in red; product: TNT-based dynamite; RARITY: one known; Author. Compare this with Monite's box - it is identical in construction.

Since then the government has published an interim (only 2 inches thick) report on their investigation and printed a fact sheet.

This site has sat quietly for over 40 years, slowly decomposing and letting nature reclaim itself . But now, our overly protective, over-funded government must protect us from ourselves. - Editor

J.A. Denn Powder Co.

1932 - 1936

In 1932 business for the Monite Explosives Co. in Lacey, Washington was not faring very well. When it went out of business and offered itself for sale, Joe Denn seized the opportunity and organized the J. A. Denn Powder Co. to buy it. Denn continued to make a TNT-based high explosive originally sold as Monite, but he renamed it "Dennite". Business was small and Dennite was distributed on a limited basis in the Northwest and as far afield as Montana. In 1936 for unknown reasons Denn closed out his business.

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MINING STOCKS

by Eric Twitty
Boulder, Colorado
&
David M. Beach
Goldenrod, Florida

It has been said that it takes a mine to make mine. Capital was the single most important financial source for mining in North America; without it machinery and supplies needed to mine and mill ores could not have been purchased, labor could not have been paid, and property could not have been bought. To obtain needed capital, leading interests representing a prospective mine organized a company and sold portions of it to the public, usually on a stock exchange. Buying shares in a mining company entitled an investor to reap some of the profits, but also to suffer the losses....and many mines were just that. A buyer received stock certificates representing his or her shares in exchange for

Figure 1 - Actual Size: 7" x 11"

The Moulton Mining Company stock is a fine sample of a certificate with interesting vignettes, fine craftsmanship, a relatively early age, and historical significance. The Moulton Mining Company was one of the first rich copper mines driven under the hills around Butte during the late 1880s. William Clark, president signee, was one of Montana's wealthiest and most influential mining capitalists and politicians between the 1880s and 1910. In addition to funding some of Butte's capital-intensive mines, he battled Marcus Daly to be top dog in Montana and won (Smith, 1992, p. 166). The top vignette captures a drilling team running an early piston drill and a third miner barring down the walls. The bottom vignette is a testament of the era's view toward industry - a miner holding a drill-steel and a doublejack hammer stands erect in front of a major railroad line. The stock was purchased in 1894 and cancelled in 1905 (on back), signifying the Moulton Mining Company was a lasting company. (David Beach)

their capital.

As artifacts, historic stock certificates have a distinct look and feel. Lettering, images and bordering are usually crisp and finely detailed, and they are printed on high-quality paper - akin to that used for money. Certificates were printed on a variety of sizes of sheets, most measuring approximately 7x11 inches. In many cases designers of certificates made an effort to give them a grand appearance. The mining company's name was usually in fancy script, a statement below it in cursive writing, and the most impressive stocks had an intricate border around the edge and a vignette in center top or bottom.

Certificates were printed from hand-engraved plates made by the same companies that produced bank notes. To fully appreciate the detail of the borders and vignettes, look through a magnifying glass. Great attention was paid to precision to demonstrate craftsmanship and prevent counterfeits. Certificates with great detail and custom-designed vignettes of a mine's surface structures or underground workings were expensive to create, hence they tended to be ordered by mining companies expecting

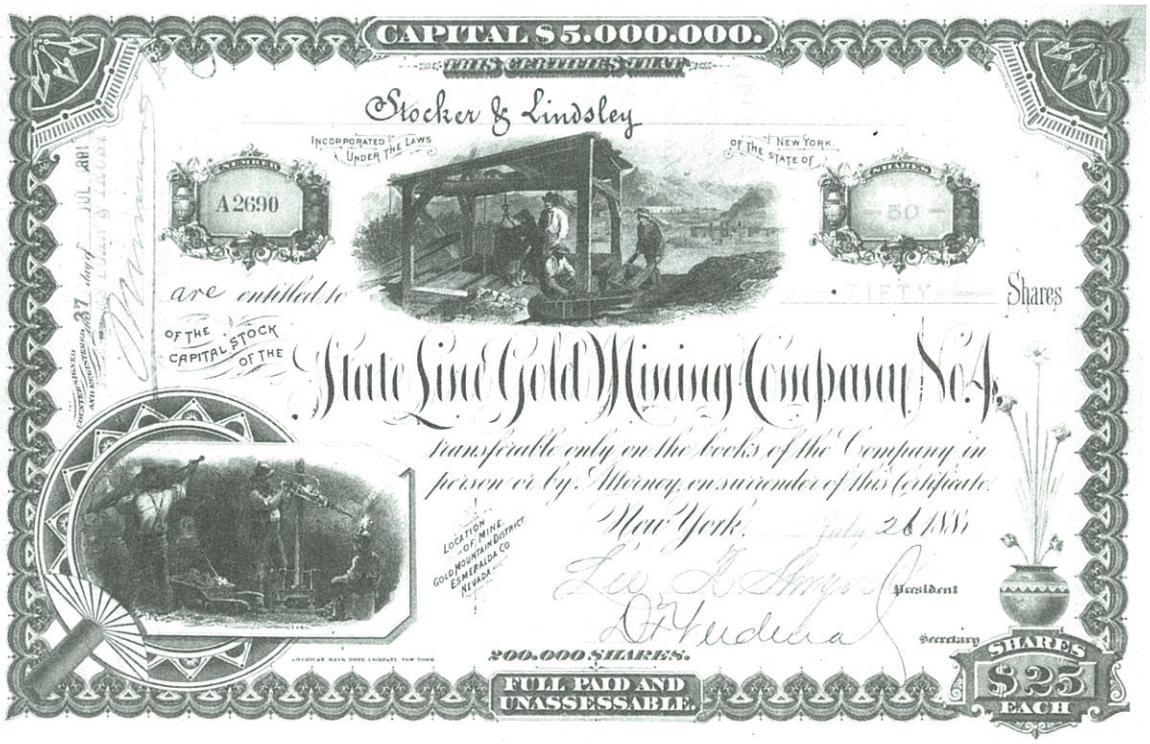

Figure 2 - Actual Size: 7" x 10¾"

The State Line Gold Mining Company certificate is another excellent example of a stock with rich vignettes and workmanship, a relatively early age, an interesting region, and a colorful history. In 1880 George Roberts purchased a mine slightly north of Death Valley that had been worked to exhaustion by Tom Shaw in the 1870s. Roberts, who was instrumental in gutting Leadville's Chrystolite Mine and selling its stock anyway, and who devised the Great Diamond Hoax, knew what he was buying in the State Line. He took out a loan and moved a 40 stamp mill down from Belmont, ran a pipeline 12 miles to springs in Lida, and set up a new steam hoist at the mine. Roberts then hired crooked mining experts who "examined" the well-equipped but worthless State Line and inflated its worth. During the publicity he organized the State Line Gold Mining Companies 1-4 and secretly retained 799,976 of the total 800,000 shares. As their values rose, he sold them off to unsuspecting investors, making approximately $6,000,000 (Lingenfelter, 1986, p 145-152). The top vignette shows miners grappling with an ore bucket raised out of what appears to be a prospect shaft. Any paying mine would have long done away with such a set up. The bottom vignette, a scene of miners drilling with an early piston drill, is identical to that of the Moulton Mining Company, because both certificates were engraved by the American Bank Note Company. Note that this certificate is uncancelled. The fact that the stock states the company was incorporated under the laws of New York is misleading - many companies attributed to the eastern states were in fact Western. *(Eric Twitty)*

to do well, or by scam artists trying to generate a feeling of confidence.

When a stock was sold it was signed by the mining company's president and secretary as an "issued certificate". Once it was cashed in by a share-holder for a return of their capital, it was stamped with "CANCELED" by the mining company. This is known as "issued and canceled". A canceled certificate was a rare phenomenon limited mostly to large, productive mines. Other operations did not remain on a paying basis long enough to return investors' capital. Mining companies not on a paying basis but anticipating striking ore issued assessments tc stockholders for further funding. Few stockholders were willing to interminably finance non-paying mines, and once they balked, a company's capital dried up and it went bankrupt. Stock certificates signifying this trend are "issued and uncanceled". In some cases mining companies collapsed before issuing stocks, or they raised enough capital such that not all stock needed to be released, resulting in blank stocks known as "unissued certificates".

Figure 3 - Actual Size: 8" x 10½"

The Anaconda Gold Mining Company is an example of a cerificate which, although not the grandest in appearance, holds historical significance. The Anaconda was one of Cripple Creek's best gold producers and dates back to the district's beginning in 1892. The president signee was none other than David Moffat Jr., a Colorado mining and railroad kingpin. He was a pioneer/merchant who set up shop in Denver two years after it was established in 1858. By the late 1860s he was wealthy enough to help finance several of Colorado's first railroads and began to invest in mining ventures. Investments in Leadville during the 1880s paid Moffat well, and when the Cripple Creek strike occurred in 1891, he saw a chance to make more money (Abbott, et al, 1994, p 376-377). Like William Clark and Butte copper, Moffat's money was important to Cripple Creek because the ore there was telluride, which required heavy amounts of capital to mine and mill. *(David Beach)*

Figure 4 - Actual Size: 7" x 10½"

Figures 4 and 5 - Certificates for the Father de Smet Consolidated Gold Mining Company and the Homestake Mining Company are examples of famous mines in a romanitcized region - the Black Hills. Both certificates are signed by president James Ben Ali Haggin, a heavyweight capitalist who, together with George Hearst and Lloyd Tevis, owned the Homestake and many other Western mines (Wallace, 1976, p 118). The vignette on the Homestake stock shows two Native Americans overlooking with awe the industrial advance of the white man. The Father de Smet vignette captures Father de Smet preaching to a group of Native Americans. Both certificates smell of the 19th century Euro-American attitude of superiority over Native Americans. Both certificates are cancelled, and both made by the American Bank Note Company. (David Beach)

Figure 5 - Actual Size: 7" x 10½"

What makes a stock certificate special? The answer depends on subjective criteria, which may be categorized as historical significance and visual impact. There is noconsensus as to which of the two factors is most important. Some of the most popular pieces are visually striking, but many people are interested in famous mines, mining districts, era, signatures of capitalists, and rarity. For example, there is considerable interest in mines from districts such as Tonopah, Goldfield, Bodie and other areas along the east side of the Sierra Nevada Mountains, Virginia City, Butte, Coer'd Alene, Tombstone, Bisbee, the Death Valley area, Cripple Creek, and Gilpin and Summit Counties, Colorado, simply because of favoritism toward the area. In other cases, certificates signed by famous mining capitalists such as David Moffat, James Ben Ali Haggin, Horace Tabor, George Hearst, Simon Guggenhiem, and Leland Stanford, interest some people. Stocks also represent eras of mining and Western development, such as those released in Colorado Territory, Arizona Territory, and Nevada Territory, and many others released prior to 1890.

Depending on the name of the mine on

Figure 6 - Actual Size: 5" x 7½"

The Quicksilver Mining Company stock is an example of a certificate that appears to be plain and dull, but one that holds great historical significance. The Quicksilver Mining Company (QSMC) was organized in 1864 to buy one of the world's largest cinnabar deposits located in the hills of the San Francisco Bay Area. The deposit was discovered in 1846 by Andres Castillero, a Mexican official, and mining began in 1847 under the direction of British-based Barron, Forbes. Predating the Gold Rush, the cinnabar deposit was the site of one of the first hardrock mines in the West. During the Civil War, President Lincoln had the mine guarded by Union troops because of the great importance of mercury in making ammunition, other products, and extracting gold from ore, The heyday of QSMC was the late 1860s and 1870s when the mine underwent development managed by J.B. Randol (Lanyon & Bulmore, 1967, p 9, 43). The richness of the cinnabar deposit was well-known and the QSMC had a profitable track record, which supported investors' confidence. Perhaps this is why QSMC certificates are so plain - no need to create confidence through imagery. *(Eric Twitty)*

a given stock, the company's president, the investor's name, and the certificate's age, what appears to be ordinary could be quite valuable and historically significant - hence a little research could be beneficial. Questions regarding certificates should be directed to David Beach, PO Box 2026, Goldenrod, FL 32733 (407) 657-7403.

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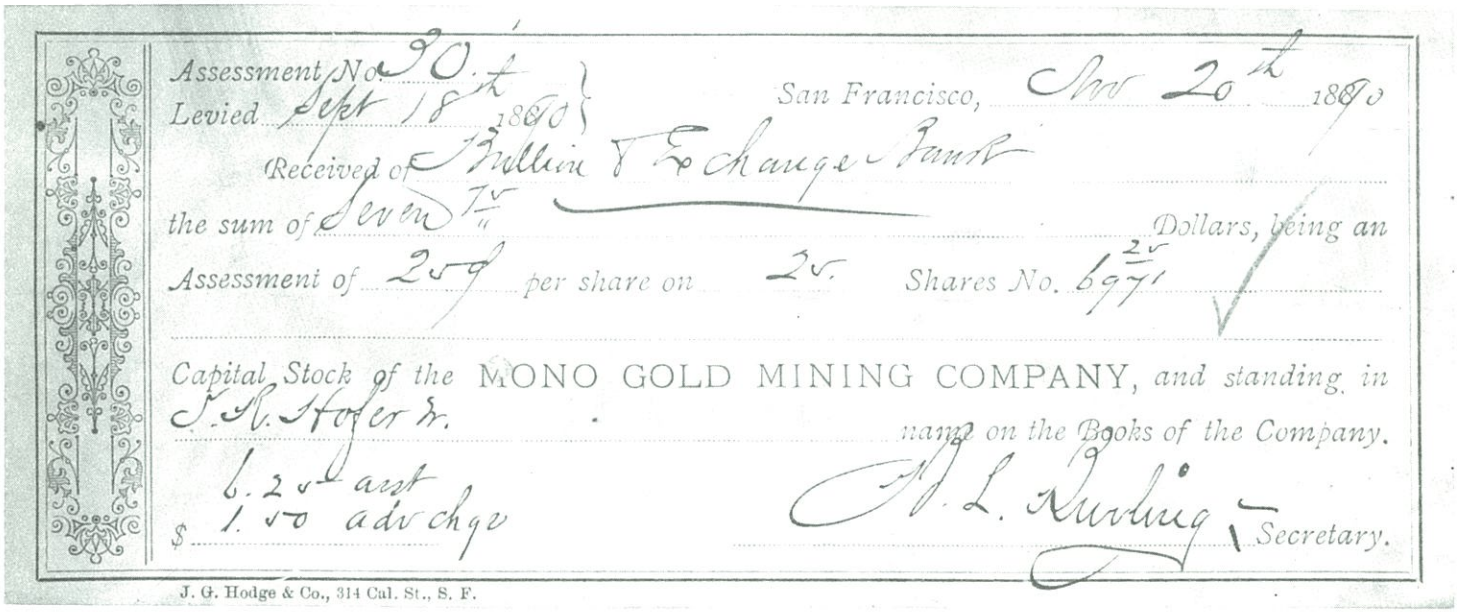

Assessment No. 90.
Levied Sept 18 1890
San Francisco, Nov 20th 1890
Received of Bullion & Exchange Bank
the sum of Seven 75/100 Dollars, being an
Assessment of 25¢ per share on 25. Shares No. 6971
Capital Stock of the MONO GOLD MINING COMPANY, and standing in
F. M. Hofer Jr.
name on the Books of the Company.
6.25 asst
$ 1.00 adv chge
W. L. Ruding Secretary.
J. G. Hodge & Co., 314 Cal. St., S. F.

Figure 7 - Actual size: 3⅛" x 7½"

The Mono Gold Mining Company document is an example of a stock assessment whereby a mining company attempted to round up more capital. The Mono Gold Mine was one of the better producers in Bodie, California during the district's peak years, between the late 1870s and mid 1880s. After a time most of the easy-to-get veins had been worked out and mines were forced to explore the faulted, complex Bodie Formation. Driving exploration tunnels and shafts required money, hence companies with little or no income such as Mono Gold Mining were forced to ask investors for capital; this assessment is dated 1890. *(Eric Twitty)*

THE MOUNT BAKER GOLD RUSH

WHATCOM COUNTY, WASHINGTON

by Lane Griffin
Reno, Nevada

In the summer of 1897 a rich vein of gold-bearing quartz was discovered high in the mountains of northwestern Washington state; thus began a frenzied gold rush that saw thousands of prospectors invade the high country of the north Cascades. Although somewhat overshadowed by the rush to the Klondike occurring at the same time, these gold-seekers uncovered several rich deposits that produced considerable ore at the turn of the century and continue to be mined today.

Gold had been found in tantalizing amounts along gravel beds of many of the rivers flowing out the mountains in this area since the 1850's. Finding the source of the gold in a mineralized outcrop was a formidable task, and it was almost 50 years before the ledge of gold was discovered. For those who have not ventured into the western slope of the Cascades, it can best be described as a temperate jungle, choked with vegetation so thick it is not at all suited to transportation nor exploration. Dense stands of fir, cedar, and hemlock populate the lower elevations with impenetrable underbrush of vine maple, devil's club and huckleberry. Glacier fed rivers run full and ice cold with their courses constantly changing. Persistent rainfall, thick snowfall, and mountain fog make comfort and navigation almost impossible; and a work season of 3-4 months is strictly enforced by the raging avalanches of winter.

Prospectors

Three prospectors who braved these hazards and hardships were ultimately successful in finding the ledge of gold in the summer of 1897 and setting off the Mount Baker gold rush that quickly followed. John Post, better known as Jack, was a veteran of the gold rush to the Fraser River in British Columbia in the 1860's. He had explored promising leads all along the Nooksak River and its tributaries in Whatcom County and he was generally acknowledged as one of the most experienced and informed of the explorers who settled in this northwestern portion of the state. He was always tramping the woods, streams and mountains except when forced by lack of money or bad weather

Rebuilding the Stampmill near the mouth of the mine tunnel after the fire. *Photo, L. K. Pattison*

to seek employment and shelter in the coastal lowlands. Exploration in this terrain required teamwork though, so Jack enlisted the aid of two other local men whose experience at prospecting was limited, but their enthusiasm was high. Russ Lambert was a local attorney who, instead of mining the pocketbooks of clients, turned to the more honored pastime of

Present view of the site above. 1996

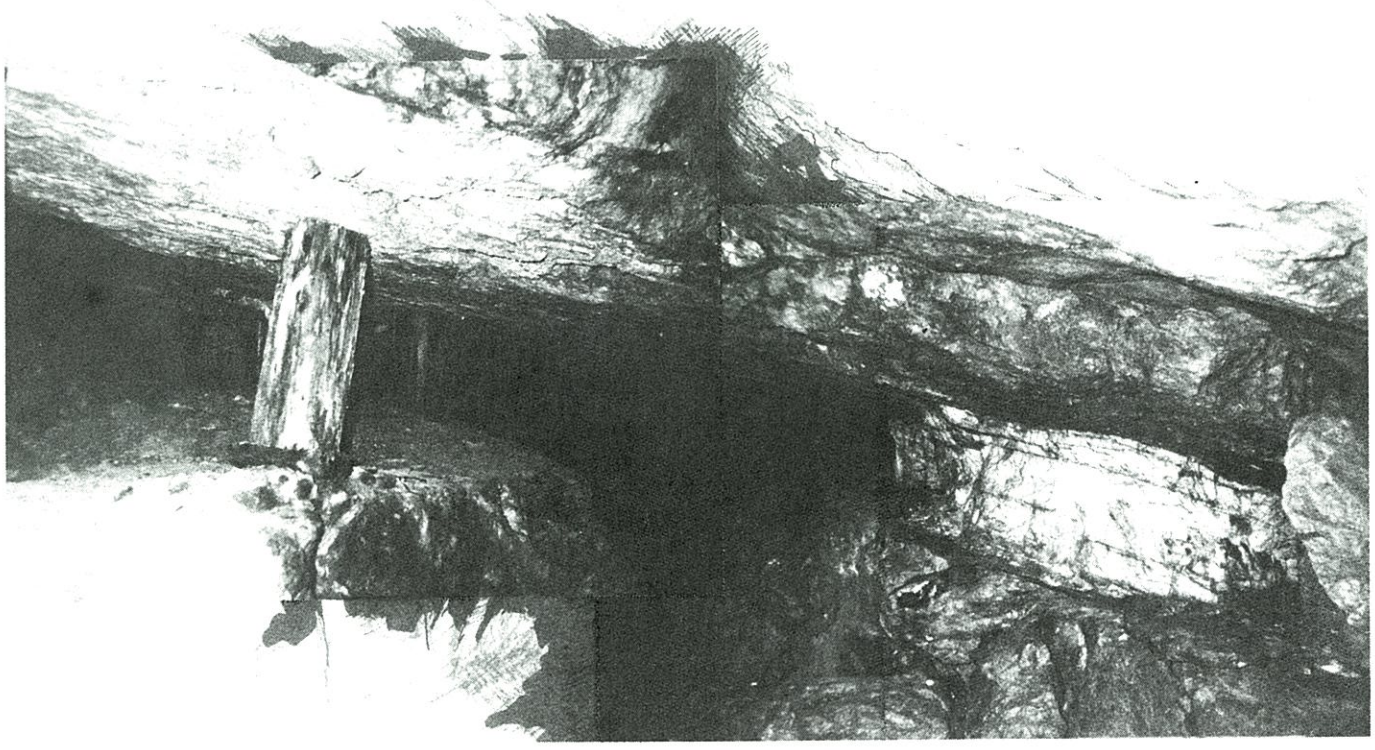
prospecting. The other partner of this gold-seeking triumvirate was Lyman Van Valkenburg, another Sumas resident who was a prominent citizen of the town.

The Discovery

On the 27th of August, after spending most of the summer in pursuit of outcropping exposures above treeline, the trio had narrowed their search to an area within sight of the majestic glacier-clad Mount Baker near the north fork of the Nooksak River. Specifically, the slopes of Bear Mountain and Twin Lakes contained rich quartz float that indicated the source was nearby. It was on this morning they decided to split up for the day - each man going where he might best examine the rocky outcrops for gold-bearing ledges of quartz. Both Lambert and Van Valkenburg returned after a disappointing day to put on a pot of beans at the Twin Lakes Campsite. It was then that they heard their partner, Jack, as he approached exclaiming that he had found it! He had discovered the rich quartz vein with visible gold scattered throughout. For Jack Post this was the culmination of his life's work. It was he who had prospected all his days without success until now. The other two partners had their careers and certainly the discovery was a great event, but not as significant as for the penultimate prospector, Jack.

Their persistence and hard work paid off with a fabulous discovery, but as is often the case with such events, now the real work

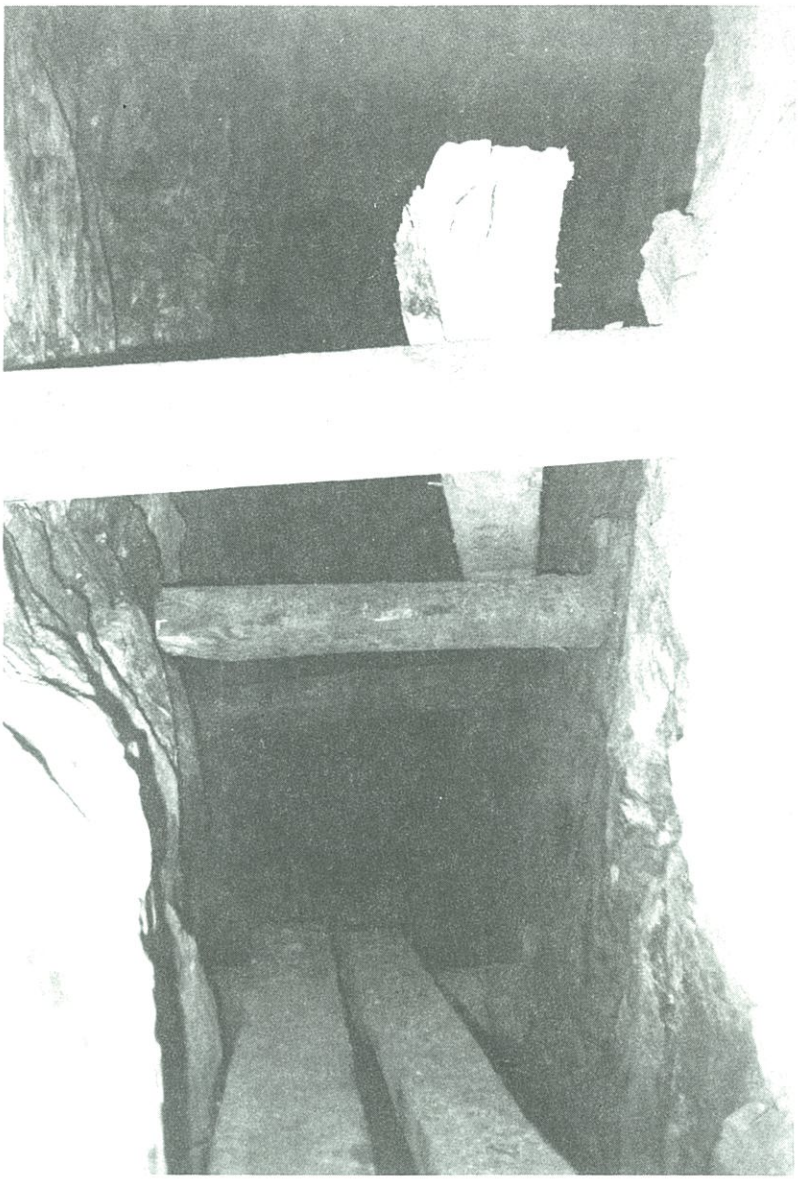
Old workings of gently dipping Lone Jack vein. Log support is 2 feet high.



began: identifying all the mineralized outcrops and laying out the courses of the claims insuring their rights amid the confusion of the inevitable rush to come.

The Rush

Van Valkenburg was selected to return to the county seat, Whatcom City, to record the claims, get supplies, and assay the samples taken. The paperwork was a wise investment because when the first assays of over $10,000 per ton became public, the ensuing rush immediately brought eager claim stakers from all over the Pacific coast. The alpine meadows surrounding the twin lakes became the busy camp of the newly formed Mount Baker Mining District. The immediate prospecting efforts were short-lived however, due to the early snows of fall, but the rush began with renewed vigor as the spring thawof the following year allowed access to the higher elevations. Pack trains following crude trails were used to get up to the treeline and from there the prospecting was done on foot. Acting as part mountaineer and part mountaingoat, the anxious explorer would comb the rain slickened lofty ramparts. The developing rush created several new towns along the route to the mines which supplied the exploration efforts and fueled the expanding wave of optimism.



New workings of vertically dipping Whist Vein. Log supports are 4 feet wide.

Development

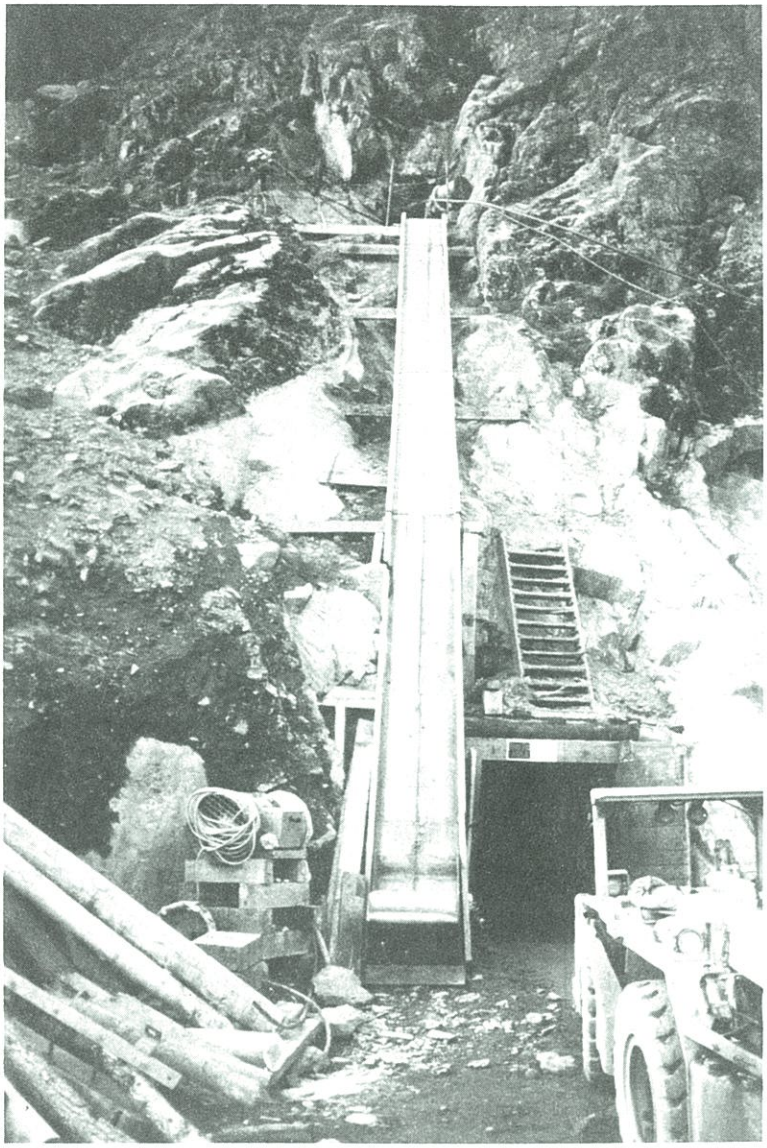
While the new gold seekers were evaluating the surrounding terrain, news

came from the Whatcom County Reveille that the Lone Jack property had been sold to a Mr. Staneslawski representing a Portland syndicate. Within another year the property had been sold again to English and Son of Sumpter, Oregon for a reported sum of $150,000. Thus organized, in 1900, by means of a steam donkey and horses, a 10 stamp mill was hauled over a trail from Glacier and erected near Silesia Creek, 4,000 feet from the mine. In 1901 a 50 ton aerial tram was installed between the mine and the mill. Because of the rugged terrain, complexity of construction, and harsh climate, it wasn't until 1902 before any gold was actually produced in any quantity. From the beginning of mining operations though, the Lone Jack vein contained sufficient free-milling gold to mine profitably by single jacking with hand steel. When operating, the mine was very successful, but fire destroyed the first mill in 1907. It was quickly rebuilt and operated continuously for the next 14 years. In 1920 a snow slide destroyed the second mill but another was built to replace it, however, it never operated for any length of time, and it also was destroyed by a snow slide during the winter of 1923-24. A 75 tpd amalgamation mill was built in 1924 but operated only a short time before it was crushed by the weight of snow during the following winter. The dwindling reserves and continued destruction of any man-made structures during the winter caused the mine to become idle until 1990. There was a small bit of excitement in the interim when the Forest Service discovered over 500 cases of dynamite left over from the 1920's in one of the crosscuts of the mine in 1964. The explosives were detonated in place, but except for destroying the track and airlines, amazingly, no other damage was done.

Murder at the Lone Jack

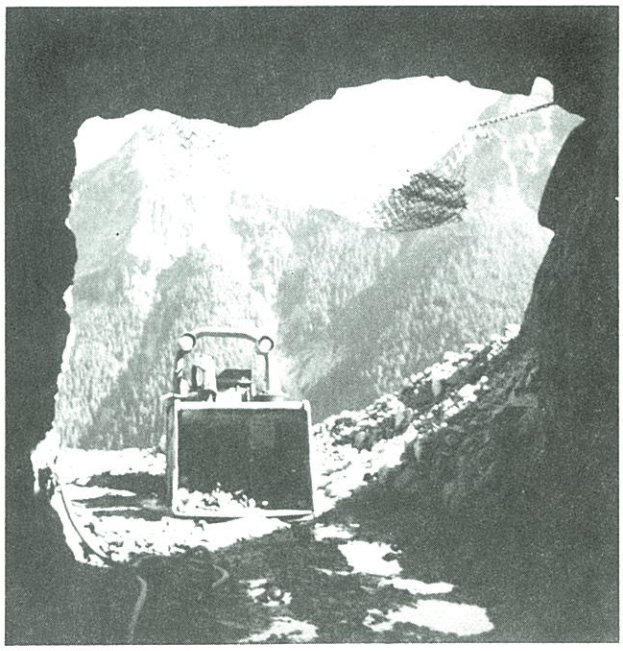
During the active period of mining the owners usually closed the operations and went on standby during the winter months because of the extreme weather and snowpack. In the year 1916, the operations were completely shutdown with the beginning of winter. To insure no one would enter the mine and high grade the gold ore, two men were hired to caretake and guard the property. A big Swede, Martin Orner, living in Glacier was recruited for the job and to make the undertaking less lonely, another man, Tony Lopan, was enlisted to also spend the winter. Their only pay would be whatever gold they could recover as they waited for Spring's arrival.

This appeared to be a good solution for maintaining security at the mine until one day toward the close of winter a weak traveler was found tramping into Glacier - it was Tony Lopan and he carried a large heavy sack. His stay was brief and he insisted that his partner had gone out hunting one day and never



Recent work on upper level of Whist Vein, haulage level and transport chute to upper level.

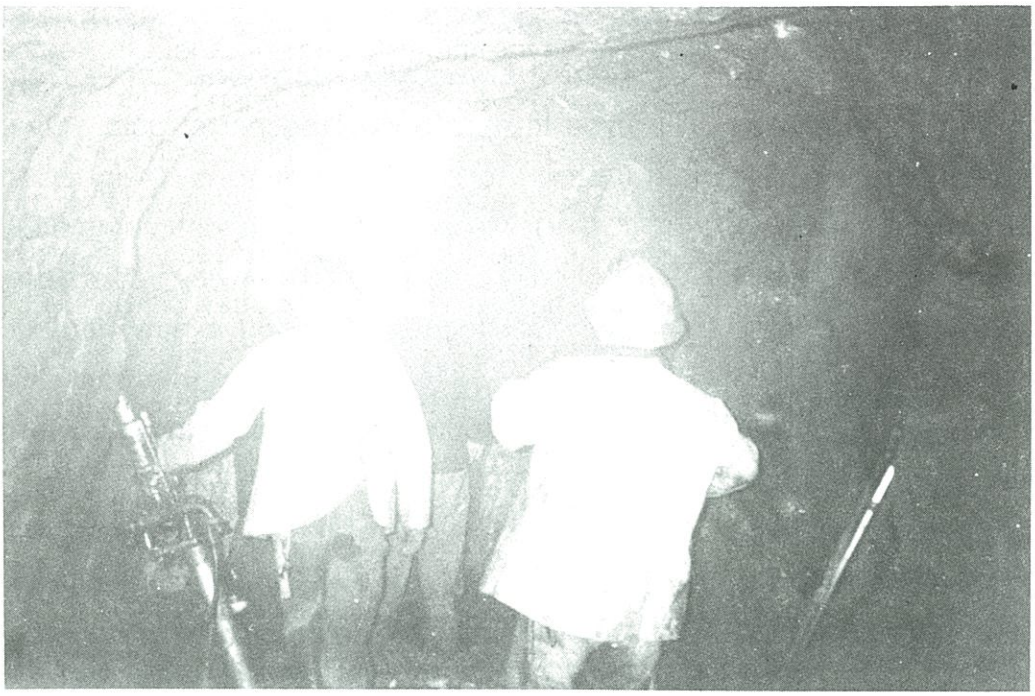
came back. Attempts were made by townsfolk to find the missing Swede, but he could not be located. Despite the suspicious nature of his partner's disappearance and his treasure filled sack, there wasn't enough evidence to hold him in custody. He departed hastily and was last heard of selling the gold to a government purchasing agent in Seattle for over $1500. It wasn't until several years passed that a local trapper who was in the vicinity casually entered one of the tunnels and passed by a water filled winze. Upon closer inspection he identified a man who had been bound with wire and sunk to the bottom of the winze by means of a rope and heavy rock. A group of people from Glacier made the trek up to the mine and identified the body as Orners', but by now, Copan had vanished and surely left the state. Unfortunately, here was another example of man's greed and the tragedy caused by his attempts to acquire gold at any cost.



New lower haulage level.

Recent Work

It wasn't until 1990 that a concerted effort was made to bring the Lone Jack



Underground examination of Whist Vein.

property back into production. At this time the lessee of the property contacted the author for a geological evaluation and proposed plan of operations. The property looked like a viable mining venture but it wasn't until a third member was enlisted that a practical plan could be put into action. The last partner was a local timber contractor and ex-geologist who knew how to work in the difficult meteorological and political climate of the western slope.

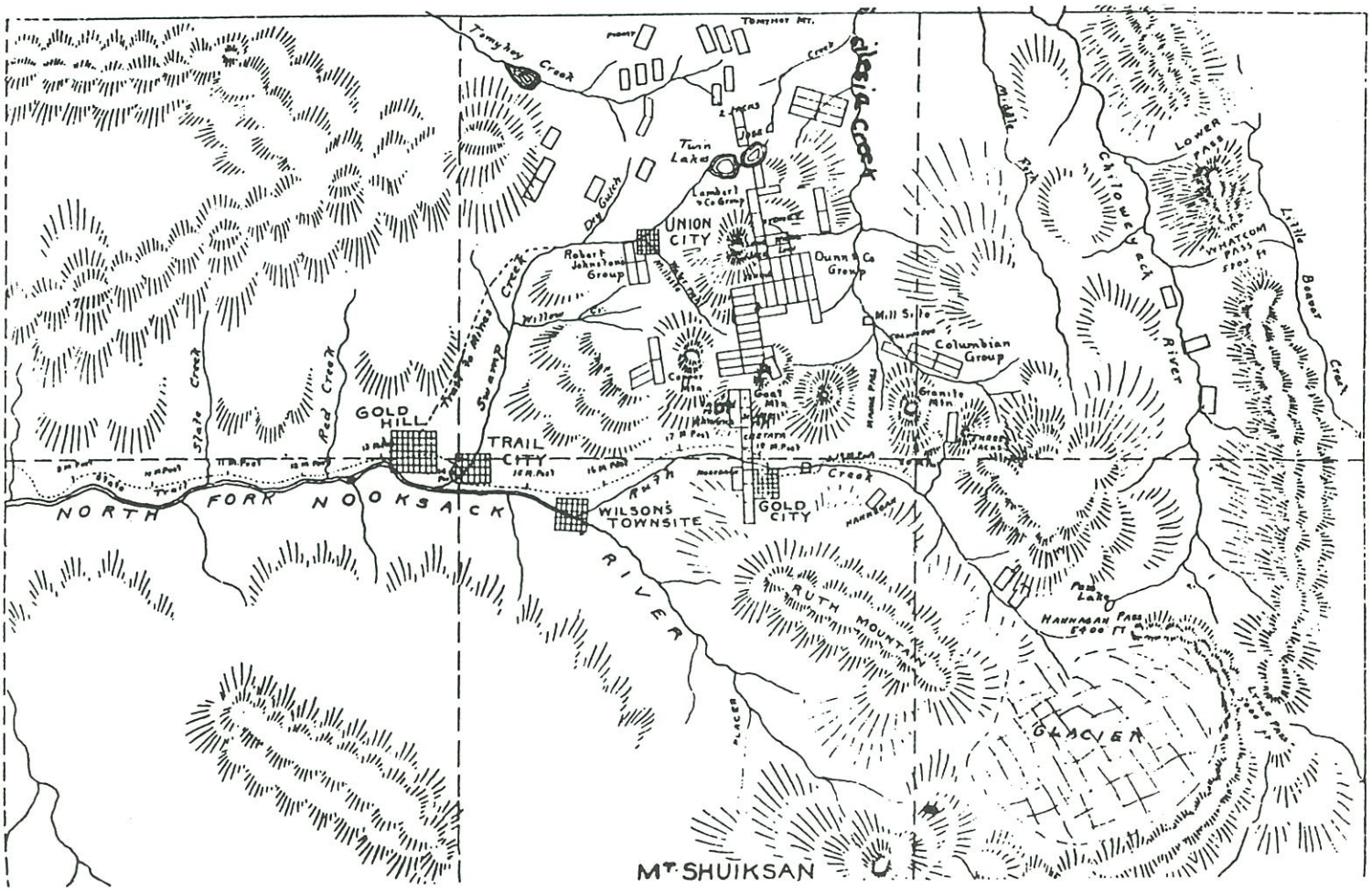
The old workings

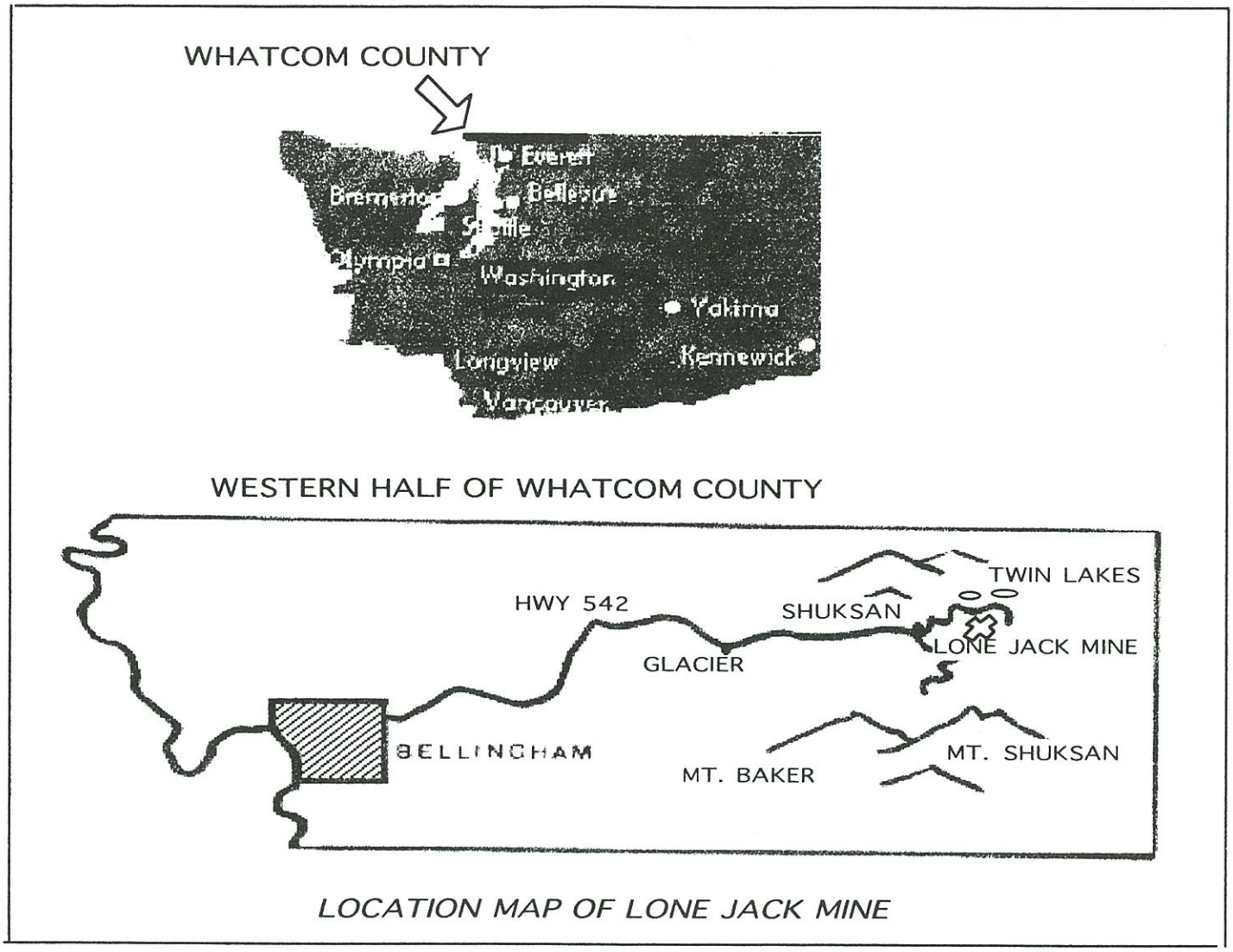
Loading holes with gelatin dynamite.

had been practically exhausted on the two major veins but a third vein lay exposed for over 100 feet, with visible gold, and was virtually untouched. A decision was made to develop this relatively thin untested quartz ledge. A haulage way was made at the lowest accessible point and stoping began upward on the vertically dipping vein using shrink stope technique with leg and stull supports. Jack leg drills were used and gelatin dynamite employed to blast the rock; the only change in mining methods from the last period of mining in the 1920's was the use of an LHD (load, haul, dump bucket loader) for mucking purposes. The vein proved to be a good producer of gold. Over the next three field seasons (August to October) the ledge was almost completely mined out above the haulage way. Last year, work consisted of relocating a new haulage way at a lower elevation to intercept the vertically dipping vein then stope upward again.

The ore is trucked to Bellingham and then shipped via rail to the Asarco mill at East Helena, Montana. The production is limited

Detail Map of the Mt. Baker District - 1897





LOCATION MAP OF LONE JACK MINE

but we have achieved the status of being the second largest gold producer in the state of Washington, all within the confines of a wilderness area.

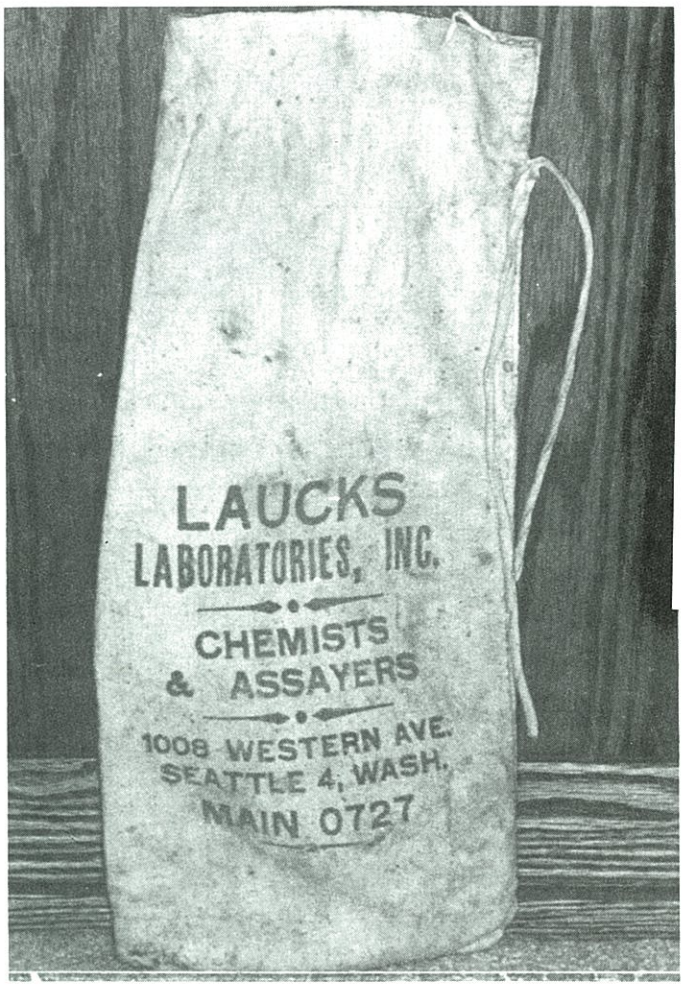
The operations are available for observation during the field season of August through October, and a weekend trip would be highlighted by equally interesting attractions nearby such as Mt. Baker and the surrounding glaciated peaks of the North Cascades. Leaving Bellingham and traveling eastward you could trace the route of the first prospectors and take in the breathtaking scenery along the Nooksack River. At the maintenance facility at Shuksan a dirt road is taken approximately 8 miles to the Twin Lakes campground (high clearance vehicles recommended). A short 2 mile hike will take you over Bear Mountain to the property where you can view an operating mine and inspect the old workings to gain a historical perspective on perhaps the most famous gold mine in northern Washington State.

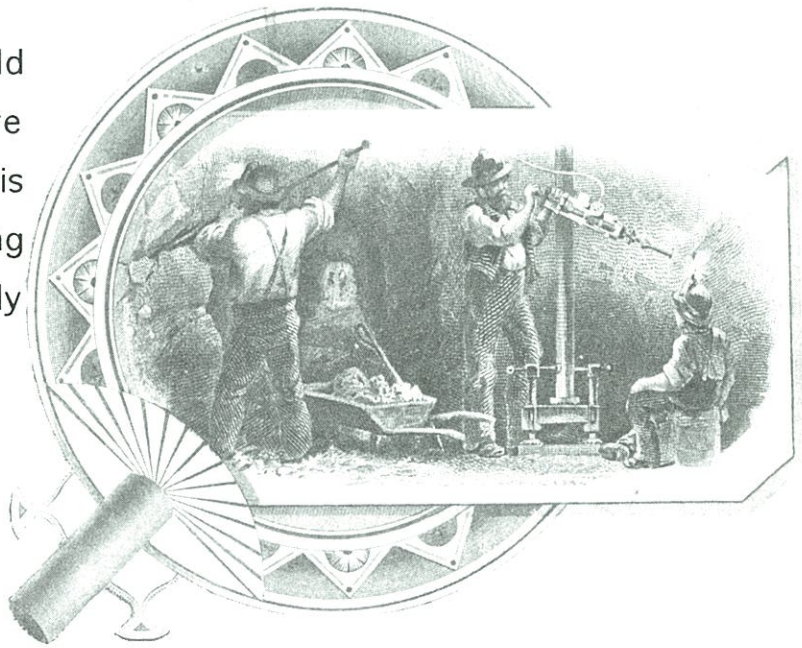
Artifacts

Few artifacts have been preserved in the Mt. Baker district due to heavy rain, snow, and subsequent erosion and avalanches. The workings are wet but accessible, however their inspection is not recommended. Old mill site and building foundations can be located after examination of the terrain. You can trace the debris of old mining and milling equipment as gravity has taken them on their slow downhill journey.

Next year will be the centennial anniversary of the discovery of the Lone Jack Vein. We may have the opportunity then to create some modern collectibles in memory of that event.

I was able to salvage an old sample bag used to keep select ore samples from the Lone Jack Mine. It is from Laucks Laboratorys, an assaying lab in Seattle. The vintage is probably 1930 - 1950.



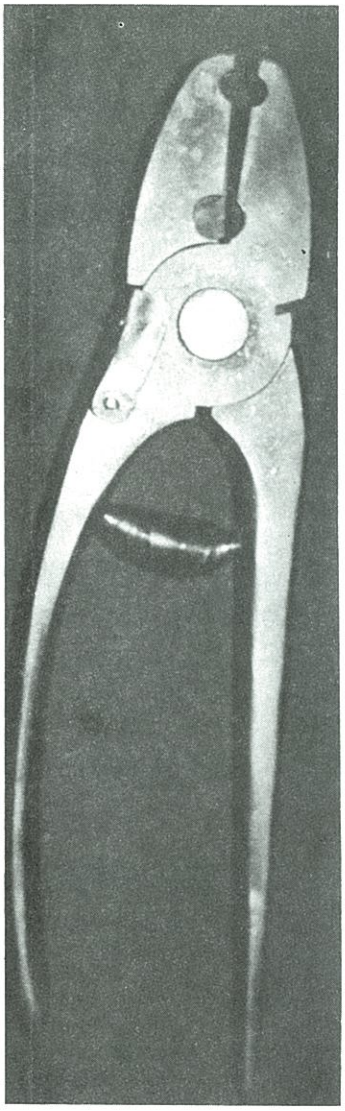


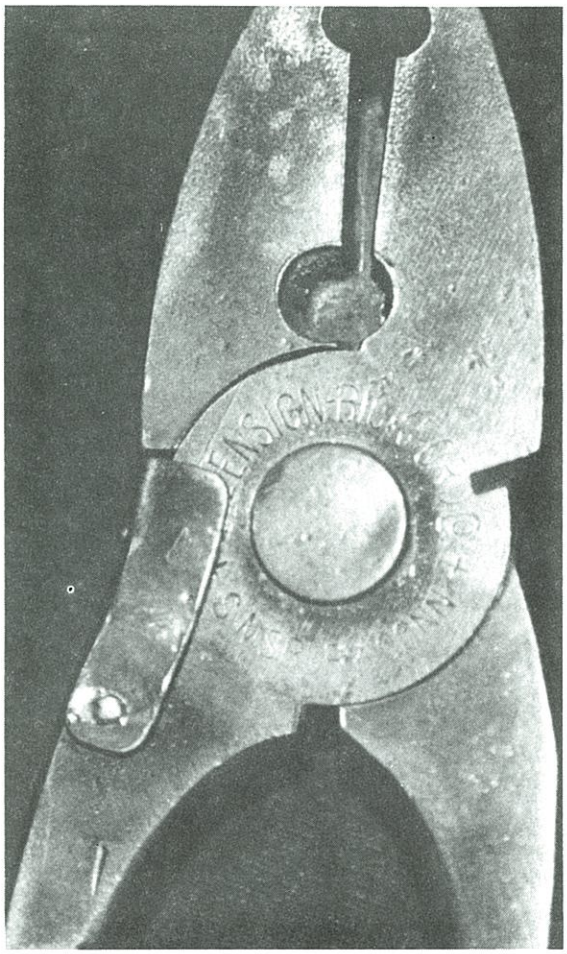
MULTI PURPOSE CAP CRIMPER
FROM ENSIGN - BICKFORD CO.

by John Kynor
Albuquerque, New Mexico

One of the things that I learned a few years ago from the Australian Aborigine folks is that we collectors share a common trait with them. The Aborigine have a tendency to "Walk About", and of course we as collectors in pursuit of that, "needed whatever", are, or at least should be, always walking about, look'n. A few years ago my wandering took me back to one of my favorite spots in Colorado; Victor. To me this is the top of the world, and some day may even be home, but Victor has been the source of some mighty fine examples of Cap Crimpers for my collection, thanks to some nice folks I have had the pleasure of meeting there. This brings me to the crux of the article.

The Ensign - Bickford Co. of Simsbury, CN, has a long established place in the history of explosives and mining in the United States, and they are well known to most of us. However, it came as surprise to me several

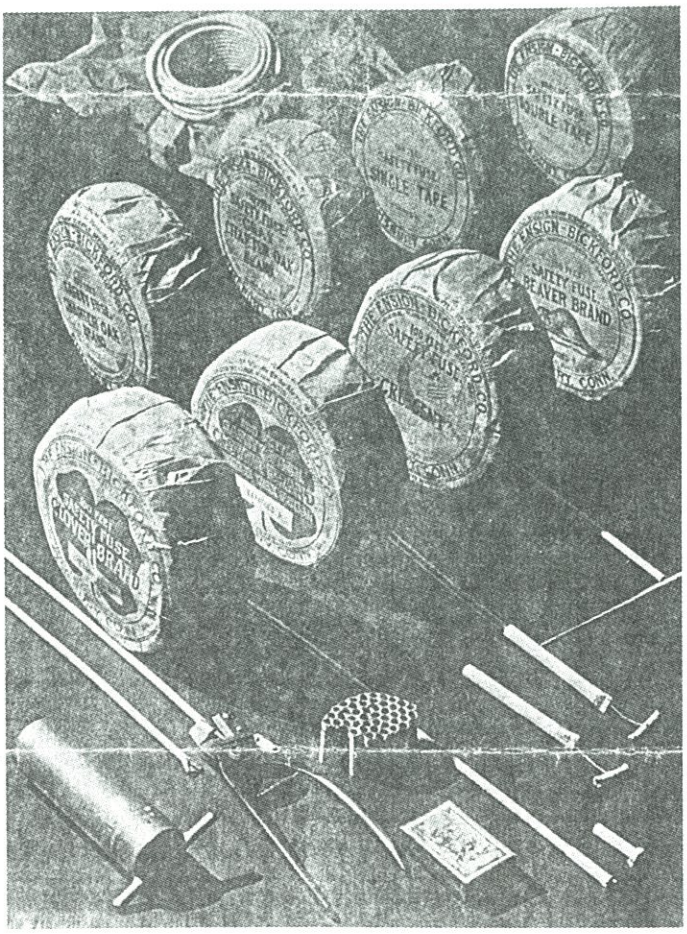




The Ensign-Bickford Co. of Simsbury, Conneticut Crimpers.

months ago that E-B had sold crimpers stamped with their logo. I learned this upon opening my mail and finding that the folks in Victor had found a very nice set of crimpers, and were offering them to me. Within a few days the set of crimpers were on my desk, and I found they were not an ordinary set of what I call "everyday crimpers", e.g. DuPont or Atlas No. 1's, etc.

The first thing I set about was trying to set a date of manufacture for this handy blaster's tool. After a few dead ends, I contacted Ensign - Bickford and achieved some success. They provided me a copy of an E-B photograph showing examples of their fuse products. In the photograph was a pair of crimpers that matched the pair I had acquired. The caption on the photo stated, "Safety Fuse and Accessories", the publication was dated 1936. It is not known as to what the actual time period was that these crimpers were available via E-B.



Safety Fuse and Accessories

The first unique feature of these crimpers is they are spring loaded. The spring is made from coiled flat spring steel and it holds the jaws open when the thumb lock is released. The pictures show the thumb lock open and the spring in a relaxed position. The crimpers are at best heavy duty, as they are 5-9mm thick and 190 mm long. A rivet with a 12mm round collar holds the two halves firmly together. On the right side of the crimper, at about the three o'clock position, on the rivet is a slot that is a wire cutter. It will handle up to 24 gauge wire by my measure. There are three tools built into the jaws, although the pictures only show two.

The tool not shown is a fuse splitter, and it has a replaceable blade screwed to the opposite side of the jaws, along with a gutter to lay the fuse in. To see this you must look straight into the crimper jaws. The other tools are a sleeve crimp jaw at the top of the jaws. This makes a 5mm wide crimp, probably not waterproof. Below this is the fuse cutter which shares the blade of the

splitter. There is a hole in right handle for stripping wire, and the right handle is flattened at the tip to act as a pry bar. The left handle begins flat then is formed into a round cap well punch. An interesting oddity I found with these crimpers is their similarity to a pair of Italian Army crimpers I have in the collection. The Italian crimpers are listed in a 1938 Italian Army manual. Who knows?

Overall these crimpers are an excellently made multi-purpose tool. I speculate that in 1936 they were not in great use as the cost to obtain one was surely greater than that of a DuPont #1, or a sharp pointed stick. Also, I'd be rather surprised if E-B gave these away with their products, but I'm sure that the engineer, miner, or blaster that had a pair was a might proud of them, and kept close tabs on their whereabouts.

Thanks to Craig Adams of E-B Co. for the historical data used in this article.

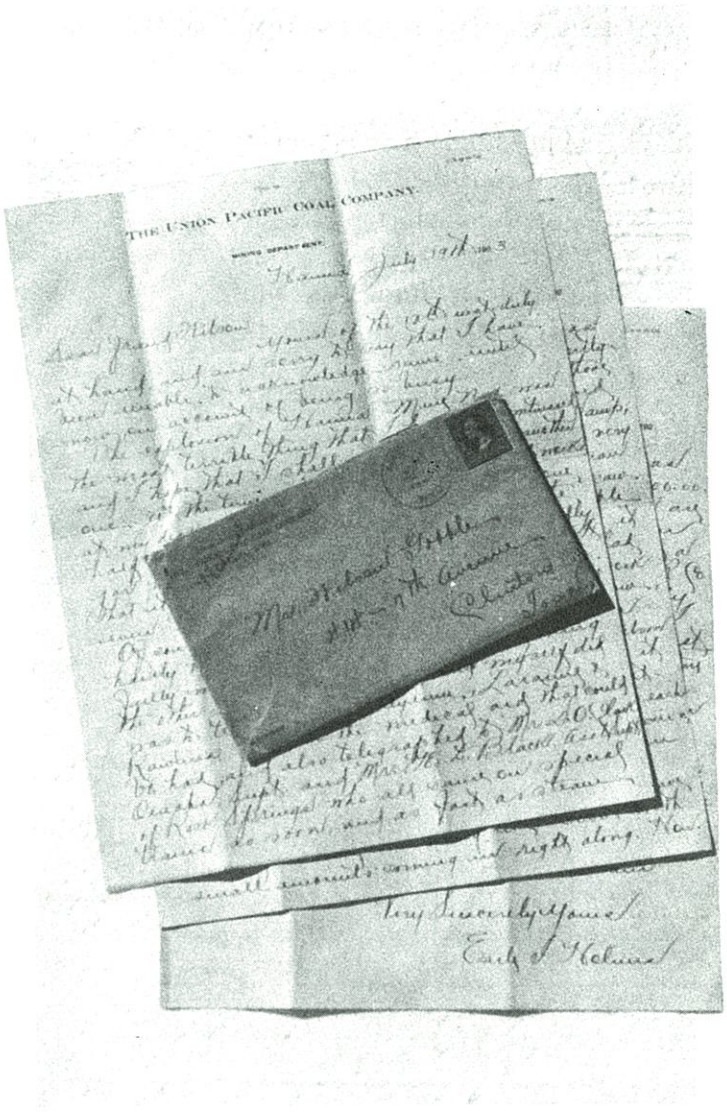
A Letter From Hanna Mine No. 1

by Deric English
Boron, California

Personal letters concerning various aspects of mining are not only collectible, but they provide insight into the pleasures and hardships associated with mining. The content of these letters may range from the misery experienced by a miner's mourning widow to the details of a mining swindle undertaken by some unscrupulous promoter. Often, these "eyewitness versions" give us a glimpse of the event unlike ones provided by the mine owner, the press, or other chroniclers. No mining story would seem complete without some mention of these obscure, written letters.

The Union Pacific Coal Company's Mine No. 1 in Hanna, Wyoming was the location of a terrible mining disaster on June 30, 1903. At ten o'clock in the morning what sounded like a charge of dynamite catapulted rock, timber, coal, and earth from the portals of the mine. Smoke filled the air as rescue workers tried to mount their rescue. The inner workings of the mine were caved and with cessation of the pumps, the mine began to fill with water. One hundred and sixty-nine men were killed; the last body was removed almost five months after the explosion.

The following letter embodies this awful disaster through the recollections of Earle Holmes, a Union Pacific Coal Company clerk. Earle was working at his desk, a half mile from the mine, when the explosion occurred.



The Union Pacific Coal Company

MINING DEPARTMENT

July 19th, 1903

Dear Friend Wilson:

Yours of the 12th inst. duly at hand, and am sorry to say that I have been unable to acknowledge same until now, on account of being so busy.

The explosion of Hanna Mine No. 1 was the most terrible thing that I have ever witnessed, and I hope that I shall never experience another one. At the time of the explosion I was at work at my desk in the Office which is fully one half mile away from the mine, and the jar was so great, and came so unexpectedly that it almost knocked me off my stool. It even broke windows almost a mile away.

Of course everybody was thunderstruck and hardly knew what to do, although realized fully what had happened. The first thing the other Clerk in the Office and myself did was to telegraph to Cheyene, Laramie, & Rawlins for all the medical aid that could be had, and also telegraphed to Mr. D.O. Clark Omaha, Supt. and Mr. E.L. Black Asst. Supt. of Rock Springs who all came on special trains as soon, and as fast as steam could bring them. I even went so far as to venture into the Mine with others shortly after the explosion, to endeavor rescueing those whom we thought still might be alive, and help carry out the dead, but the Black Damp, and the After Damp were so intense that very little could be done. One place that I can never forget seeing, was our party saw about 27 of the dead, but were unable to get to them on account of the above. As it was, four of our party played out and had to have assistance out of the Mine. The work of getting out the dead bodies is very slow, and up to date only 12 bodies have been recovered out of about 200. I tell you Wilson one cannot realize what a terrible thing it was, unless you are right here to see it.

I know of three fine women here, who each gave birth to a child on the day of the explosion, and their husbands are among the dead in the Mine. Just think of that.

We have a relief committee here who have already received something like $6000. with small amounts coming in right along. Now, Marcus A. Hanna whom the town was named after even sent a draft for $100.00.

Well Wilson, just as soon as things are in a fair shape, I am going to resign my position here at Hanna to accept a better one with the Southern Pacific R.R. Co. at San Francisco, and I have not fully made up my mind as yet, whether I shall come home, before going to the coast or not, but shall decide in the near future and will let you know.

Can you tell me where I can address a letter to Cora, that is, if she has started on her trip.

Well old boy, write soon, and please do not show this letter to anyone for I have written it in a hurry, and have paid no attention to mistakes.

With kindest regards to all I am

Very Sincerely Yours

Earle I. Holmes

JOHN C. GREENWAY, THE AJO EXPERIENCE

by H. Mason Coggin
Phoenix, Arizona

A vandalized monument marks his burial on a small hill in the Sonoran Desert. It splits the distance between his desert home and the vastness of the Ajo open-pit copper mine. The plants died long ago and the surrounding wrought-iron fence is gone. His bronze name plate was removed from its copper stone, but the largest monument to John C. Greenway is his open-pit mine. Spanning the horizon for nearly a mile, it shows a million colors in bright pastels along deliberately sculptured contours. Viewers stand in awe of this engineering and industrial marvel. This, the largest man-made feature in Western Pima County, can be seen from space. The copper from this mine electrified the world and brought light and power to homes, schools, hospitals, factories and business.

Greenway's vision and creative genius organized and boot-strapped this mine through the first copper leaching operation in North America to a successful copper sulfide operation. The mine made a major company of the Calumet and Arizona Mining Company and, after the merger of 1933, it make an even greater company of the Phelps Dodge Corporation.

The Ajo operation outlived Greenway by fifty-seven years, until the operations were suspended in 1983. Unlike the man, however, the mine may live again in the next century. A large reserve of unmined copper still lies in the bottom and walls of this pit. Uneconomic to extract in 1983, this resource will be reworked with new methods and new technology when the world needs the copper.

Greenway's only physical problem was a troublesome gall bladder. After the New Year's holiday of 1926, he decided to have it removed. Soliciting the top medical technology available at the time, he underwent surgery in New York's Theodore Roosevelt Hospital. After a successful operation a blood clot developed, and he died a few days later. He was forty-six years old. His survivors included his wife, and infant son, John, and two stepchildren from Isabella's first marriage to Robert H. Monroe Fergerson.

His special funeral train to Ajo was followed by the General's friends and acquaintances. Even in death he commanded the respect of those who knew him. Some of the wealthiest and most politically powerful people in the United States sent condolences to his widow and children. Statesmen, executives, soldiers and fellow officers from the Rough Riders' campaign in Cuba and his command in France marched in his funeral procession with miners from his industrial developments in Michigan, Mesabi, Bisbee, Ajo and Mexico. Greenway would have appreciated the dropping of social status for the solemn occasion.

He wanted a "miner's funeral", to be buried in rock on the top of a hill, surrounded by friends, family and in full view of the mine he had created and the desert home he had designed. The excavation for his tomb penetrated solid rock on a small hill near the Ajo Pit. A concrete vault was constructed and clad in a half-inch thickness of copper armor to protect his body.

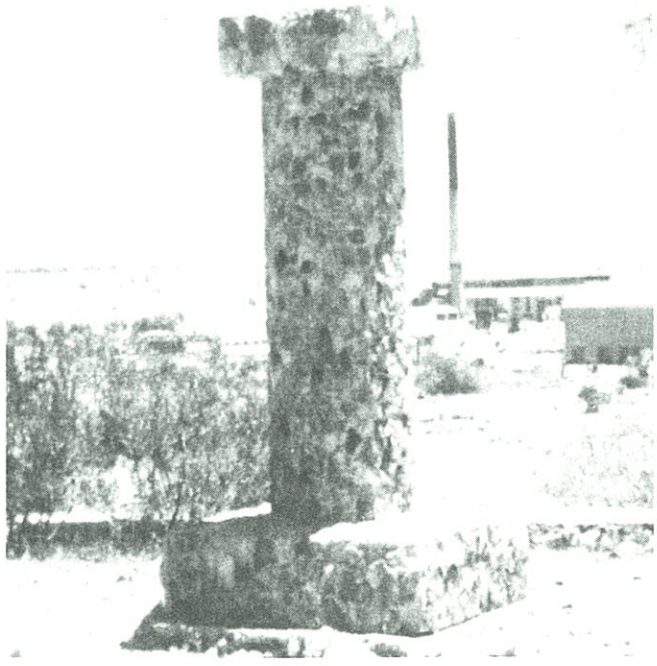
At the burial the flowering tribute from his many admirers was laid over the seal. People spoke elegantly of his many virtues, generals and soldiers told of his military honors, giants of industry recounted his achievements and politicians told of his dedication to policy and his many supporters.

Eight members of Arizona's 158th National Guard infantry fired a "soldier's farewell". A poem, written in tribute by Richard Howard Whiteside to his former boss and benefactor, was read at graveside.

JOHN C. GREENWAY

They say he built five towns and wrote his name
in letters big on scrolls of fame,
His was the measure of a man, they say,
As cortege train with garlands hung
Southwestward wends its way.
Of hero's mould, as silvery taps
In silvery noted pain,
Now loud and clear, now sweet and low
Is sobbing its refrain.
I only knew he was my friend
And stumble blind through byways home
A whimpering child again.

Richard Howard Whiteside[1]



GREENWAY COLUMN, C. 1994. The unfinished column represents Greenway's untimely death. The smelter stack in the background was abandoned in 1982 when Phelps Dodge refused to bow down to the Union during a strike. The Copper Depression that followed in the mid 1980s insured the death knell for the operation. Photo by author.

GREENWAY'S BRASS PLATE ARIZONA HISTORICAL SOCIETY IN TUCSON. *Photo by author 1994*

A circular concrete wall supporting a wrought-iron fence was built around the hilltop. A flagpole was erected in the center of the circle and an oleander hedge was planted inside the fence. A broken marble column indicating Greenway's early death and his unfinished life was placed beside a large copper stained rock that provided a mount for a bronze name plate. A galvanized steel pipe brought water to the green, well groomed hedge and the rare small plot of grass in the vastness of the Sonoran Desert. For decades the green of this grave marker contrasted with the surrounding forest of saguaro, cholla and prickly pear cactus.

His thin straight-lipped statue in future years would represent the state of Arizona on the nation's Statuary Hall in Washington, D.C. American Legion Posts across the country honor his name. Schools, roads and even buildings bear his name.

Politically, Greenway was following a path aimed at the presidency of the United States. He had joined the Rough Riders as a private and emerged at the end of the Spanish-American War a colonel. He was promoted for bravery on the battlefield by Teddy Roosevelt and after the charge on the San Juan Hill, Roosevelt said of Greenway:

> *Greenway was the second man to the top of San Juan Hill and the first behind enemy lines... I only envy Greenway. I wanted to be the first there myself, but he outran me![2]. He was a 200-pounder, slightly over six feet tall, who thrived on embalmed beef and regarded the entire Cuban campaign through intense heat and jungle as nothing but an enjoyable outing, the chance of fight on the morrow simply adding the needed spice of excitement.[3]*

Roosevelt recommended Greenway for the rank of brevetted captain and gave him the Silver Star Citation for gallantry in action. Fourteen years after the Rough Rider experience, Teddy Roosevelt wrote a letter to Greenway immediately following an incident when Mr. Roosevelt was shot while making a speech in Oyster Bay on November 2, 1912. He said:

> *My Dear Jack: You'll probably never know how much your unflinching loyalty to me for the past fourteen years has meant - I believe in you, I'm very proud of you and while I cannot help laughing a little at the absurd overestimate you made of my conduct in the talk of the shooting, still I am glad that you do overestimate it.[4]*

Roosevelt asked him to become the Commissioner of the General Land Office in 1906, but Greenway declined. He led Arizona's Bull Moose Party in Roosevelt's successful bid to upset Taft as a third-party Republican, only to lose to Woodrow Wilson, a Democrat, in the General Election. However, Roosevelt carried Arizona[5], and Greenway received the ballots of eight states in a 1924 bid for the Vice Presidency at the Democratic Convention only to be passed over for Charles W. Bryan, the brother of William Jennings[6]. Had Greenway survived the gall-bladder operation, he might have achieved his goal. He won recognition as a Yale athlete. His World War I service won him honors and decorations from both French and American armies.

> *Near Verdun, France, October 23, 1918, lieutenant colonel, One hundred and first Infantry, Twenty-sixth Division. During a terrific enemy shelling on two of his battalions, and after both his battalion commanders had been wounded, Colonel Greenway personally directed the activities and*

JOHN CAMPBELL GREENWAY STATUE at the Arizona Historical Society in Tucson. *Photo by author 1994.*

greatly encouraged his forces by his presence. Leading them in attack, he demonstrated the utmost valor at the most critical moments, and he was the first of his command to enter the German trench which marked the objective for the day's attack.[7]

In the War Department files with his military record is a communication to General Greenway from Brig. Gen. George Van Horn Mosely attesting the valor Greenway displayed in action on the Toule, Cantigny, Chateau-Thierry, St. Mihiel, Menses and Douamont fronts. For good work and gallantry in action he was promoted to the rank of lieutenant colonel.[8]

Greenway was to earn his colonelcy on the field of battle. He sought service as soon as we entered the war and came to France in the autumn of 1917 as a major of Engineers. Reporting at General Pershing's headquarters at Chaumont, his marked ability and outstanding personality indicated him at once as an extremely desirable officer for staff duty. But he was so essentially an outdoor man that he was restless on the staff and longed for line duty. He was soon sent to the front and saw service with the First and Twenty-sixth Divisions, first as an engineer, and later as a field officer of Infantry, commanding his regiment in the principal battles of 1918. He participated in the actions of Cantigny, Campagne-Warns, Aisne-Marne, St. Michiel, and the Meuse-Argonne. He was severely gassed in action. My last memory of him in France was when, just before sailing for Lyons in December, 1918, he came to see me at Tours, wearing the eagles of a colonel which he had so gallantly won. His bravery in battle had been outstanding in an army of brave men. To the silver star won at Santiago in his splendid youth he now added the French Croix de Guerre, the Legion of Honor, and the Etoilec Noire. From his own country he received the distinguished-service cross, given only for the most extraordinary heroism in action, beyond the call of duty, and to win which one must descend into the very valley of the shadow of death. We of the old Army have always held the faith that the highest reward that can come to him who wears the uniform is the approbation of those with whom he has served. No man ever had this in more generous measure than John Campbell Greenway. In another age than ours he would have been a Richard the Lion-Hearted, a Phillip Sidney, or a Chevalier Bayard, for his was the dauntless soul and the tender heart, without fear and without reproach. [9]

In both his athletic and professional careers, he played to every game. He had the courage of a champion and he never accepted second place. He was just as competitive in his professional life when he entered the field with a Bachelors of Science in Engineering.

After college he started as a furnace helper, a lowly position, with Carnegie Steel Company in Duquesne, where he earned $1.32 per day. He advanced through foreman of the Mechanical Department at Duquesne [10] to Assistant Superintendent of Mines for the United States Steel Corporation in Michigan. He was the General Superintendent of the Oliver Mining Company in Minnesota's Mesabi Range, where he started the mining operations there [11]. In 1910 he was named manager of the Calumet and Arizona Mining Company. In this position he developed the mine at Ajo that allowed him to reach the zenith in professional development.

AJO

Mineralization at Ajo had been known for thousands of years. Native Americans crushed and ground the iron and copper minerals with animal fat and used them to decorate their bodies. Local Pimans called this paint *au'auho*. The Spanish apparently corrupted this to *ajo,* their word for garlic [12]. Their stone tools and grinding pits can still be found in the area.

After the Gadsden Purchase on 1853, American explorers tried to develop the area. Although highly mineralized, it defied development. Its remote, desert location and low copper content eventually discouraged all attempts at profitable operation. Shipments of the richest ores were hauled to the Gulf of California by mule train and shipped to Swansea, Wales, for treatment. The tenor of the ores, however, could not long support the extensive freighting costs, and this venture quickly failed. Several attempts to directly smelt the ores failed, because the copper content was too low and Ajo lacked a convenient source of cheap fuel.

One of the infamous attempts, the McGahan Vacuum Furnace [13], was executed by Fred L. McGahan, a slick-tongued Irishman who spoke elegant chemicaleze and was able to court the influential out of their holdings. He convinced the two leading companies at Ajo that his furnace would solve their metallurgical problems. He claimed that his furnace, by not allowing nitrogen to contact the ores in the smelting process, would allow the costituents of the ores to separate into their natural elements. Once separate they could be tapped off at various levels and sold at market purity. After receiving nearly $100,000 from the principals of the companies, McGahan started construction on the furnace.

The furnace was a brick-lined structure, twenty-five feet high and six feet in diameter. Cylinders for oxygen and hydrogen gasses surrounded the furnace and a massive pump to maintain the vacuum was mounted over the furnace and above all else. Spigots placed up the side of the furnace would allow the operator to extract the elements at thier appropriate level. The spigot at the bottom tapped off the gold. a little further up one for the silver, the next for copper, then calcium, sodium, silicon - and at the top spigots for oxygen and hydrogen. It was convincing to all but those educated in metallurgy. To them it was delirious nonsense. The smelter could not and would not work. On the day that it was to be blown in McGahan called for an additional $200,000 payment before he would proceed further. The investors realizing, at last, that they had been bilked by McGahan, had him arrested and taken to court on obtaining money on false pretenses. He countered that he was being victimized by the investors. They eventually dropped their charges and McGahan got off with most of the money they had given him.

It is unfortunate that the furnace is not in existence. It would make a great monument to the investor's greed, a promoter's promise and fradulent investments in mining.

START OF MINING c. 1917. As soon as the railroad started bringing in the equipment the mining operation started. Photo from George A. Newett.

The oxide nature of the near-surface ores prevented concentration of the low-grade oxide copper ores. This is still a problem today, although these same oxide ores produce about 50% of Arizona's copper. They are still treated using some of the process principles pioneered by Greenway and his staff at the Ajo mine.

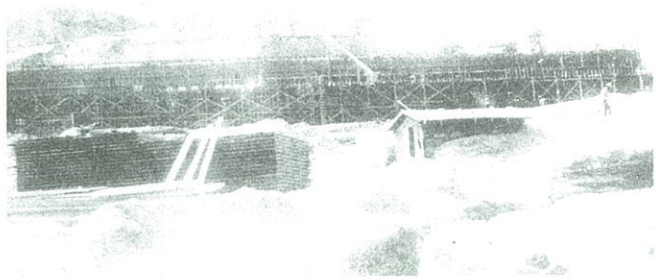
Greenway first heard about the Ajo copper deposit from a driller friend of his who had just finished drilling for the New Cornelia Copper Company (NCCC) in 1910. After listening to the driller, he knew that the district should be examined by a professional. For this work he first recruited Ira B. Joralemon, a young mining engineer, [14] who was already acquainted with the property.

Joralemon, who later wrote of his involvement in Ajo, said of Greenway:

> *John C. Greenway was responsible for much of my success in the seven years from what I called the end of my apprenticeship in exploration until I entered the army in World War I. I first met Greenway on my return from the Promontorio and, as he was replacing Powell, he was to be my boss. Even at first glance you couldn't help liking and trusting him. He was tall, well built, and erect - an old Yale athlete. He bacame the best manager among those who ran the big copper mines. He was open-minded in encouraging discussion and even opposition -- until he made up his mind. Then, in miitary fashion, everyone must follow his decision without question,. I think this is an essential for good management. Unfortunately, a few did not feel this way and they had to leave.* [15]

He recognized the deposit as belonging to the copper bearing quartz monzonite porphyry model that was then being described by geologists from such diverse camps as Butte, Montana, Brigham Canyon, Utah and Ray, Arizona. Among the older and younger formations of the district, he mapped the six-square-mile outcrop of the Cornelia Quartz Monzanite. Noting the areas of intense alteration and the areas where copper oxides were most plentiful, he outlined an area of interest. In accordance with the current theories of the day, he anticipated that this copper oxide area represented a large deposit of copper sulfide mineralization that had been eroded and the original sulfide minerals leached to leave these oxide minerals. Still working within the geologic model, and by estimating the amount of copper minerals that had been oxidized and leached, he estimated that about 50% of the copper had been leached from the surface and would be redeposited as a sulfide at the water table. From the elevation of ground water in the sparse seeps and wells in the area, he would have been able to estimate the depth to the water table and from this calculate the thickness and grade of the enriched sulfide blanket. His report to Greenway stated his findings. [16] [17]

After reviewing Joralemon's report, Greenway was convinced that the deposit was a large one and made note of its many problems. Greenway then convinced the C&A to acquire an option on the New Cornelia Copper Company. [18] This option, for 70% of the NCCC's 1,200,000 shares of stock, called for the stock to be issued to the C&A as it spent money in developing the property. The remaining 30% of the stock was delivered to its original investors.



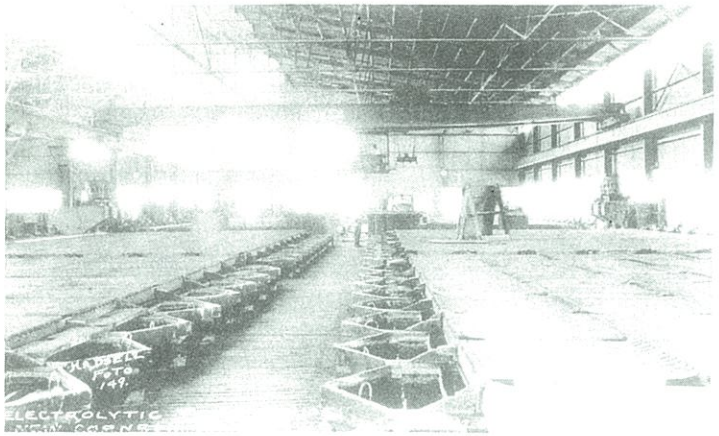
VAT LEACHING, c. 1917. These are the vat leaching tanks that the NCCC constructed to hold the broken oxide ores while they were bieng leached. Photo from George A. Newett

Greenway based his faith in the property on his conviction that the great masses of oxidized ores would be amenable to a new technology which he would develop. He immediately consulted metallurgist Dr. L. D. Ricketts, an acquaintance from Bisbee. Together they devised a complicated leaching process that included sulfur recovery from smelting the Bisbee ores at C&A's Douglas smelter. As sulfuric acid, it could be used to leach the copper from the surface oxides. The copper could then be recovered by precipitation on iron or perhaps through electrowinning.

Greenway expressed his optimism in a letter to his close personal friend George A. Newett on Feb. 11, 1913 as follows:

> *When I came west three years ago to take charge of the Calumet & Arizona properties, I formed the belief that the future of rich Bonanza properties, like those owned by the Calumet and Arizona Mining Company in Bisbee, should be coupled with their natural complement, a low grade steam shovel property, where the tonnage and characteristics of the ore could be fully developed by drills prior to the mining and beneficiating of the ore. I found this property at Ajo. I do not care to give you the figures at this time, but will tell you something of interest when you come out to see us later.*

Greenway's optimism found immediate opposition from several noted professional engineers and metallurgists, who immediately recorded their belief that a process could not be developed to render the Ajo ores commercial.[20,21] The C&A showed caution in 1912, when the Annual Report described the New Cornelia as "an outcrop of copper-stained monzonite... being developed for disseminated ores by a systematic drilling program to find an open-pit minable deposit."[22] No mention was made of the metallurgical problems, the remoteness of the site or the drastic lack of water.



ELECTROLYTIC TANK HOUSE, NEW CORNELIA COPPER CO. AJO, ARIZONA, c. 1920. Photo by Harsell. This photo shows the surprising amount of automation that the NCCC achieved at this early date. Photo from George A. Newett.

Diamond drilling and test pitting began as soon as the agreement with New Cornelia was signed. Greenway personally directed the drilling. But, before this reserve could be classified as ore however, the bench scale leach tests had to be corroborated by a pilot plant operation. If this program would upscale and Ajo's oxides could be leached economically, ore reserves would stand at 30 million tons of 1.5% copper. Infeasible results would mean these reserves would be as worthless as its detractors predicted. The pilot work started as Douglas, followed the next year by a larger program at Ajo. If there were any doubts about the feasibility of the process, they would be worked out in still a larger pilot plant.

In his letter to George A. Newett of December 1, 1914, Greenway describes the process at Ajo:[23]

Ajo is coming on fine. No. 1 well is down to the water and I believe we have plenty of it. We will know in the next month.

On the leaching we are making very satisfactory progress with the process I originated. I should say we will be ready to make final recommendations is this matter within three months, perhaps sooner.

Getting patents through the Government Office will probably be the last thing we have to clean up. I expect this information will be sufficient for the present, so with kind regards, I will close.

Greenway, Ricketts and the Calumet and Arizona's research staff quickly developed a pilot plant flow sheet for the Ajo ores. This system involved crushing and leaching the ores with dilute sulfuric acid in lead-lined vats. From the start the plan leaned toward electrowinning copper directly from solution. This would produce cathode grade copper which could be marketed directly and within a month of mining. Precipitation and conventional smelting required six months from the time the ores were mined until a copper product could be sold. This quickened cash flow was a large plus for the electrowinning process. Greenway's direct involvement in this work would later be recognized by two of his chemists when they referred to his approach as the "Greenway Process."[24]

The pilot plant allowed the observation and resolution of many problems before the plant was built. Among these problems, how to handle increasing amounts of dissolved iron in the solution and how to insure the purity of the resulting copper cathodes required innovative solution and resulted in net savings of about 2.5 cents per pound of copper.[25] As a result, the NCCC cathodes from the final plant assayed within the required 99.9% copper.

Finding an adequate water source at Ajo was a challenge that has followed the camp to the present time.

THE MILL AT AJO c. 1923. An overall view of the mill. The smoke stack at the left was from the sulfide roasting plant which roasted ores from Bisbee to provide sulfur gasses for the leaching operation. Photo from George A. Newett

Greenway tackled this problem in his typical technical manner. He and one of the C&A's geologists theorized that some of the later volcanic formations in the area had flowed over a large alluvial basin. They suspected that the trapped gravel was a confined aquifer filled with water. They were right, but the gravels were not as open as they might have wished.

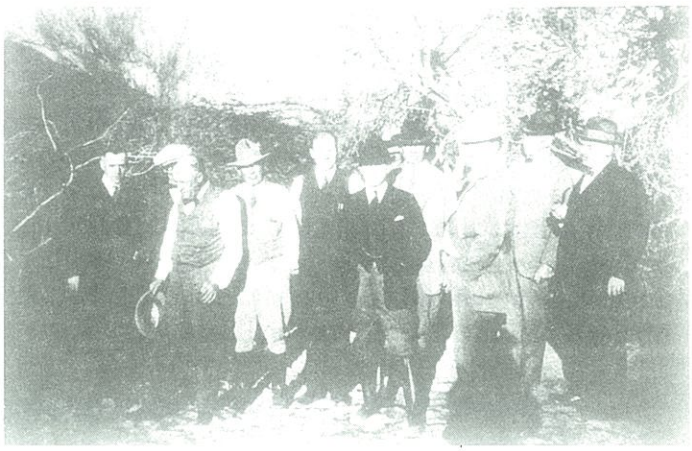
The first well was drilled in 1913 and tested at 197 gallons per minute. A mine shaft into this formation was planned for a location about 100 feet south of this. They were located about thirteen miles northwest of the Ajo open-pit, where the well and shaft were completed to a depth of 665 feet. Together they produced a little over 500 gallons per minute. This was considered adequate for the planned 4000-ton-per-day leaching plant and the townsite.

Meanwhile, testing of the Ajo leaching system continued at C&A's Douglas Smelter. At this pilot leaching plant, a recovery of 80% was easily demonstrated.[26] The smelter demonstrated its ability to make surplus sulfuric acid. The anticipated iron build-up was solved by aerating some of the high-iron solution with sulfur dioxide. In this operation, the iron was precipitated out of solution. Operation of the pilot plant also indicated that some of the pregnant solution would have to be bled off and sent to iron launders to further check the ferric iron build-up. Now the company decided to move the pilot plant to Ajo for additional testing. After an entire year of operation they expanded the capacity to 40 tons per day, and on Jan. 31, 1915, they put this larger plant into operation. During its first year, it treated 12,000 tons containing 1.25% copper and achieved a recovery of over 70% on the copper in the ores.

Based on the continued success of the pilot plant, the company directors committed to a $4 million investment for a production plant at Ajo. The plant would produce 36 million pounds of copper annually and could be completed by July 1, 1917. This thirty-six million pounds of copper was sufficient to electrify a community of about one million people at that time.

George Newett, in a letter to Greenway[27], quoted Mr. T.F. Cole, another director of the C&A and the NCCC, as saying: "Greenway has dug up a most valuable property in New Cornelia, and is doing good work for all our interests in the Southwest."

Greenway argued with the C&A management that good housing and a town with churches and schools would attract the stable labor force that the operation requires. He won, over the objection of several C&A officers and directors.[28] Although they agreed with Greenway's approach, they argued over how much and when.



NCCC DIRECTORS IN ROUTE TO AJO, c. 1923. From left to right, James E. Fisher - Secretary and Assistant Treasurer, William H. Newett - Visitor, William B. Mershon - Director, M. Curley - Superintendent, Thomas H. Collins - Director, Charles Briggs - Director, Thomas H. Collins - Director, Walter B. Congdon - Director, Thomas F. Cole - Director, Frank J. Kohlhaas - Director.
Photo from George A. Newett - Director

He had just come from a similar environment, where he had built the town of Colarine and must have been convincing in his arguments. He hired reliable architects and started building a model company town in the Southwest. The townsite was nearing completion by the end of 1916 and included a plaza, business block, schools and the best hospital in Pima County.

To manage the day-to-day operation of the mine, Greenway invited his old friend and former employee from the Mesabi to join him in Ajo. Mike Curley arrived in Ajo in 1913. He would have received a written offer from Greenway that would have been very business-like and short of words. If his letter to Harry Clark was typical of his offering, it tendered a reasonable wage, moving expenses, a short description of the job situation and little else. There were no promises, but a general tone of great appreciation.[29] Mike Curley stayed with the New Cornelia through all its mergers and retired as Manager of the New Cornelia Branch from the Phelps Dodge Corporation in 1939. In all of his work at Ajo from 1913 on, Curley supervised the day-to-day operations.

The initial mine design called for three 100-ton steam-shovels and a system of rail haulage that dumped directly into a gyratory crusher where the ore would be crushed to ¼ inch. The crushed ores were conveyed to one of twelve 5,000-ton lead-lined concrete tanks. Four sulfur dioxide adsorption towers reduced the ferric iron to an insoluble ferrous compound, which was precipitated out of the solution. Electrical power for the entire operation was provided by a power plant, brought on in July, 1917.[30]

Connecting Ajo to the outside world, the Tucson Cornelia and Gila Bend railroad (TC&GB) tied into the Southern Pacific at Gila Bend. This short line started from Gila Bend, a stop on the Southern Pacific,[31] and began making daily service to Ajo when completed in 1915. The entire 35 miles was lined with 70-pound rail. During its first year of operation, it hauled 64,000 tons of freight.[32] Ownership was held by the El Paso and Southwestern railroad and the Calumet and Arizona Mining Company. The El Paso and Southwestern was a wholly owned subsidiary of the Phelps Dodge Corporation and the Copper Queen Mining Company, the C&A principal rival in Bisbee. This railroad ownership is another curious aspect of the strange courtship between the Calumet and Arizona and its friendly competitor, the Phelps Dodge Corporation, which ended in the merger of 1931.

To be continued in the next issue

Endnotes

1. Funeral Papers, *Greenway Collection* at the Arizona Historical Society in Tucson.
2. Clippings from the *Greenway Collection* at the Arizona Historical Foundation in Tucson.
3. Clippings from the *Greenway Collection* at the Arizona Historical Foundation in Tucson.
4. Roosevelt Correspondence in the *Greenway Collection* at the Arizona Historical Foundation in Tucson.
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7. Address by Senator Robinson, *Acceptance and Unveiling of the Statue of Gen. John Campbell Greenway*, 71st Congress, 2nd Session - Senate Document No. 167, U.S. Government Printing Office, Washington, 1931.
8. Address by Senator Robinson, *Acceptance and Unveiling of the Statue of Gen. John Campbell Greenway*, 71st Congress, 2nd Session - Senate Document No. 167, U.S. Government Printing Office, Washington, 1931.
9. Address by Major General Harbord, *Acceptance and Unveiling of the Statue of Gen. John Campbell Greenway*, 71st Congress, 2nd Session - Senate Document No. 167, U.S. Government Printing Office, Washington, 1931.
10. Boese, Donald L., *John C. Greenway and the Opening of the Western Mesabi*, Itasca Community College, Grand Rapids, Minnesota, 1975.
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12. Hoy, Bill, "Hardscrabble Days at the Ajo Mines - George Kippen's Diary, 1855-1858," *The Journal of Arizona History*, Vol. 36, NO. 3, Autumn, 1995, p 233.
13. Joralemon, Ira B., *Copper, The Encompassing Story of Mankind's First Metal*, Howell North Books, Berkeley, CA, p. 185.
14. Joralemon, Ira B., *op cite*, p. 189. Joralemon claims that he was in the district in 1909 and already working for the C&A. The original publisher of the book insisted that it be titled Romantic Copper for good reasons.
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17. Gilluly, James, *Geology and Ore Deposits of the Ajo Quadrangle, Arizona*, Arizona Bureau of Mines, Bull 141, Univ. of Arizona, Tucson, Arizona 1937.
18. "John C. Greenway", *Arizona Mining Journal*, Phoenix, Arizona, October 1917.
19. Greenway, John C., *Letter to George A. Newett*, Feb. 11, 1913, in the author's possession.
20. Joralemon, Ira B., *Adventure Beacons*, op cite, p. 63.
21. Joralemon, Ira B., Copper, *The Encompassing Story of Mankind's First Metal*, op cite, p. 194.
22. *C & A Report to Stockholders 1911*. The term monzonite describes a certain type of igneous intrusive rock that is slightly different than the rock type being recognized as bearer of most of the world's low grade copper deposits. Greenway's break with the popular preachments of the geological pundits of the time was yet another perceived blunder.
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24. Morse, H.W. and H.A. Tobelmann, "Leaching Tests at New Cornelia", *AIME Transactions*, AIME, NY, NY, vol. 50, pgs. 830-955.
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28. Narrated by Tom Jay of Tucson, Arizona - Bisbee, Arizona, February 21. 1975.
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30. *C & A Annual Report to Stockholders 1915*
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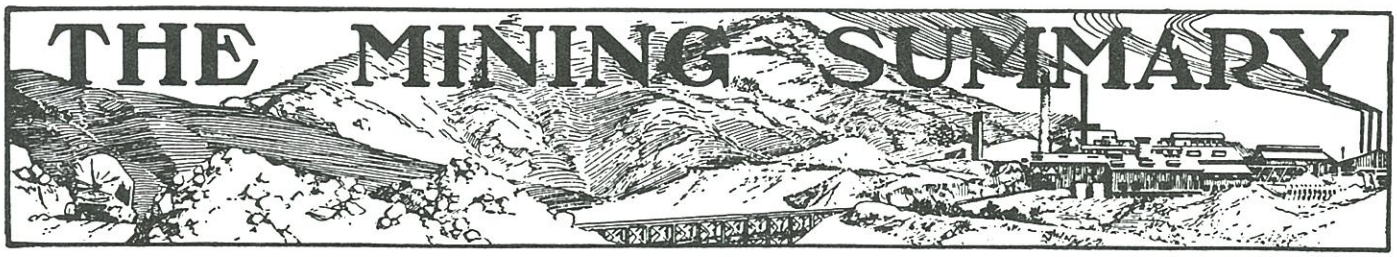
32. *C & A Annual Report to Stockholders 1916*

WHAT'S NEW IN COLLECTING

Henry Pohs received this plaque from friends and admirers at Errol Christman's lamp-in last January. This was an exceptionally well designed plaque that exhibited a miniature safety lamp and bore the inscription:

"From his mining lamp collecting friends who appreciate his years of labor and scholarship in the field of mining lamp history and collecting."

Photo courtesy of Don Powell



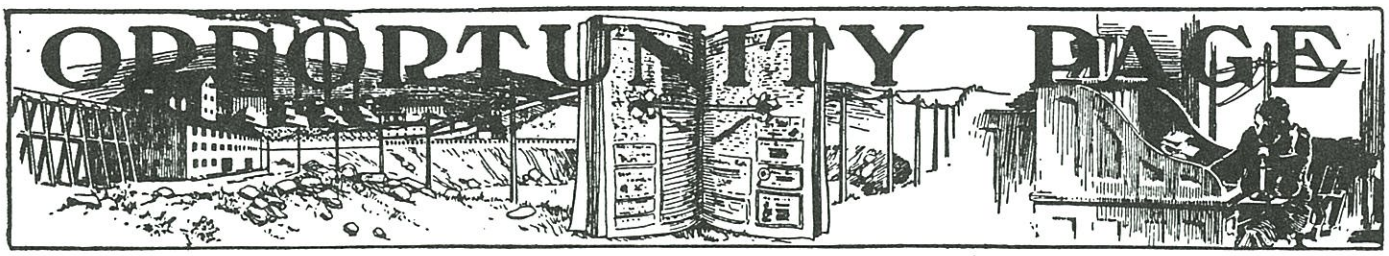
WHAT'S NEW IN COLLECTING

Although not directly related to mining, this label represents an interesting application of mining activities. Martin Jensen of Reno, NV found this label in Pershing County, NV. Coppin's Club Soda was a bottled water business started in the 1950's by a miner who lived in Keyston, NV. As can be seen on the label, it was produced by Coppin Dude Gold Mines, Inc., Tunsten, NV. We're not sure where they got the water, hopefully it wasn't mine drainage - but they sure has the right idea.

This is an interesting logo for a popular washing powder company from the early 1900's. It depicts black twins holding a sign for Fairbanks Gold Dust Washing Powder, obviously trying to cash in on the popularity of the Alaskan gold rush. This box was obtained in central Nevada.

Tom Johnson of Elko, NV recently acquired this exceptional candle box made by the Dearborn Manufacturing Co. I know that I've encountered blue candle wrappers which contained these candles, but I've never seen a box. Good hunting, Tom.

This candle box was recently located near Goldfield, NV. The vintage is approximately 1910-1915. The dimension of the box is 9 3/4" x 13 1/4" x 6". The end is stamped black and the wood is of thin, relatively flimsy construction.



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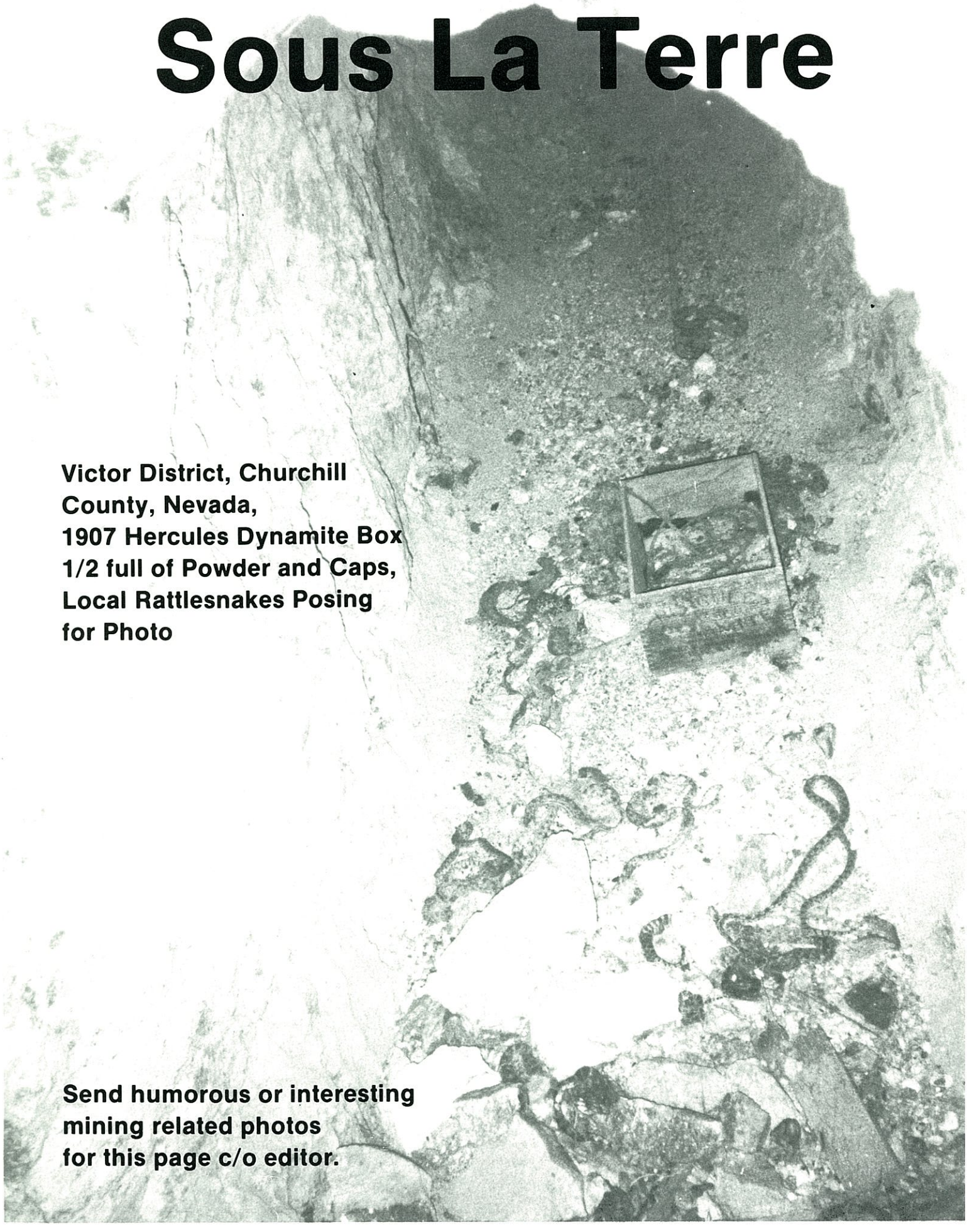

Victor District, Churchill County, Nevada, 1907 Hercules Dynamite Box 1/2 full of Powder and Caps, Local Rattlesnakes Posing for Photo

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